the OIL AND GAS JOURNAL

PUBLISHED WEEKLY

SEPT. 14 1959

What FPC must decide in Phillips case ▸ 57

Rayne field: Pattern for future gas buying? ▸ 66

Report: Reserves in Oklahoma's Morrow sand ▸ 94

Now rig engines are cooled by ebullition ▸ 103

ONE DOLLAR PER COPY

In management...in research...in the field
...the key to quality is PEOPLE

HALLIBURTON *oil well cementing company* *duncan, oklahoma*

OIL AND GAS JOURNAL
Vol. 57 No. 38

Contents September 14, 1959

THE WEEK'S NEWS

General Interest

Mid-Continent Oil and Gas Association Sets Up New Top-Level Post . . 60
Where Credit-Card Buying Is Headed 62
Louisiana Offering More Offshore Acreage for Leasing 70
Canada's Top Oil-Gas Expert Heads Energy Board 72
Industry Briefs 74
California Oil Men Facing New Problems—Missiles 76
Dissenting Opinion Filed in Richfield's Public-Utility Ruling 77

Exploration-Drilling

Fifth East Texas Salt Dome Is Proven Productive 68
New Drilling Methods May Be Tried in Moho Project 70
Rank Anadarko Basin Wildcat Hits 74
Dry States Have Mixed Emotions About Oil 157
Special Methods May Coax Oil From the Niobrara 158
Northwest Kansas: The Midwest's Newest Oil Province 167

Foreign News

Russia Envisions Network of 4,000 Miles of Gas Pipelines 80
Shell's New Drilling Barge Is Heading for Persian Gulf 81
Indiana Standard Bidding to Build Refinery in Thailand 81
Higher Product Prices Bolster Peruvian Oil Industry 82
Venezuela Warns Against Crippling Oil Strike 82

Production

Gulf Adding Two Test Floods in West Texas Field 61
Another Big Sale Made in Alabama's Citronelle Field 74

Pipelining

What the FPC Must Decide in the Phillips Case 57
Texas Eastern's Purchase of Rayne Field May Set Gas-Buying Pattern . . 66
Pipeline Briefs 77

Processing

Congress Passes Temporary 1-Cent Gasoline Tax Increase 59
Three Refineries Remain Tied Up by Strikes 59
Processing Briefs 65
Workmen Pluck 65-Ton Reactor From Unit at Fire-Damaged Refinery . 72
API Report Shows Shorter Interval Between Oil Changes, Grease Jobs . . 74

EVERY WEEK

Advertisers' Index . . . 199
Book Review 98
Calendar of Events . . 45
Classified Advertising . 195
Deaths 198
Drilling Contractors . 152
Drilling Statistics 190
Editorial 55
Equipment Men 141
Exploration Highlights 157
Foreign News 80
Foreman's Page 115
Journally Speaking . . 51
Markets 193
New Equipment 122
Personals 185
Process Costimating . . 93
Production 191
Refining Statistics . . . 192
Selected Monthly Data 194
Statistical Summary . . 189
They Say 41
Trade Literature 132
Watching Washington . 60

Technology-Operation section on next page →

The Oil and Gas Journal is published weekly with an additional issue in January by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1959 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

TECHNOLOGY—OPERATION

Production

Aluminum Withstands Corrosive Effects of Maracaibo's Water ... **84**
By R. S. Dalrymple
An 8-year test program and 2 years of experience with oil installations show that the high concentration of oxygen helps protect aluminum which is rendered passive by an oxide film. This is especially significant in view of the extreme corrosion experienced by oil operators in the Venezuelan lake.

Reserves Study of Morrow Sand, Light Field, Oklahoma **94**
By B. G. Barby
The Purdy sandstone of the Morrow series is a prolific reservoir with high recoveries. Other Morrow sandstones possibly will not equal the high recovery factor of the Purdy, due to lateral variations in porosity and thickness. High-porosity zones can have accurate total recoveries projected from pressure graphs early in the life of a well.

Drilling

Aluminum Withstands Corrosive Effects of Maracaibo's Water ... **84**
By R. S. Dalrymple

Now Rig Engines Are Cooled by Ebullition **103**
By Ed McGhee
This method of cooling does a more efficient job in taking heat away from cylinders. As a result, cylinder-liner temperatures are more uniform and generally are lower than with conventional cooling. Great Western Drilling Co. has outfitted two rigs for ebullient cooling and has ordered materials to equip another.

What the Russians Have New in Drilling **116**
This includes bits with unloaded bearings, drilling three wells simultaneously with a single rig, an electric downhole motor, drilling with bottom-hole explosions, and an electrical tangential drill. A report by eight Russian drilling engineers.

Refining-Processing

Cosden Pushing Polybutene Production **87**

Catalytic Desulfurization of Cat-Cracker Feed Stock **88**
By Harold T. Connally
This treatment removes metals, nitrogen, and sulfur rather extensively. Naphtha yield is increased and coke make is decreased at constant conversion. Product octane is increased. Some profit is realized by the operations but more important is the flexibility with regard to product-quality improvement.

Process Costimating—56 ..... **93**
Operating costs—platinum-catalyst reforming.

Standard of Cal Improves Maintenance-Data Handling **111**
By G. F. Sauer
A new system which includes Kardex slide and Linedex vertical files is replacing a file-folder method. Crossreferencing makes it possible to find the proper card instantly.

Pressure-Enthalpy Diagram for JP-4 Fuel **112**
By Thorpe Dresser and R. B. Smith
The vapor compression cycle is an important consideration in the use of jet fuel. An accurate values of thermodynamic properties at temperature and pressures of use are necessary. Here is a pressure-enthalpy diagram which gives these values instantly.

The Foreman's Page **115**
Problems in picking refractories.

Pipelining

New Tool Surveys Pipeline Route Fast **106**
By Maurice E. Fuller
With the aid of a Tellurometer a pipeline route survey was completed for Pacific Lighting Gas Supply Co. with a saving in both time and money. The new tool is designed to measure long distances with accuracy and speed.

New Pipeline Map Coming **110**

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Sept. 14, 1959

Motorists, oil industry are saddled with new tax:

The 1-cent hike in federal gasoline levy is being neatly wrapped up in Washington (p. 59).

Only hope: It's now tagged as a temporary levy, set to expire automatically in 21 months.

But many Washington hands cynically doubt this script will be followed. Temporary taxes have a way of becoming permanent.

Congress has committed itself to investigate plans to make the tax burden for building highways more equitable. What happens from here on depends on outcome of the study.

▼ ▼ ▼

Refiners with aromatics extraction plants are benefiting from the steel strike.

Benzene prices are firm, and the petroleum industry is under full steam to make up for lost production from coke ovens.

Ortho-xylene, another petroleum basic, is in better demand for companies can substitute it for very scarce naphthalene in making phthalic anhydride.

Felt may be the answer for filtering jet fuels.

American Felt Co. has just introduced a micron-rated filter cartridge for process industry use. It says filter is working with a wool felt capable of removing fine particles suspended in jet fuels.

Latest Navy specs call for filters to pass a test in which rough particles 0.2 micron in size will be retained by the filter. The wool felt undergoing tests will do this. Development work still is in progress on the item.

▼ ▼ ▼

New, economical paving process is being tried out by Long Island Lighting Co., using a waste product of the big utility's electric power plants.

The byproduct, fly ash, is mixed with lime and moisture to the original surface material. It is then rolled into a smooth and compact finish ready for almost immediate use.

How this new paving material holds up will be of keen interest to the asphalt and cement industries.

Venezuela's unitization edict has oil companies hastening to comply, according to Caracas reports.

The edict was given in several fields primarily to eliminate flaring of gas. One field has already been shut in until the field is unitized and gas injection started. The boom also has been lowered on many high gas-oil ratio wells.

Plans call for unitization programs similar to those in effect in this country. Equity participation of each company in a reservoir will be determined.

The program is still rather hazy from there on. In some fields each company will continue to operate its own properties. In others there will be one operator with joint ownership of injection facilities.

Prospects for an experimental atomic explosion underneath Alberta's Athabasca oil sands are brighter than ever.

Press sources in Ottawa predict a committee of experts soon will report that in 4 months of study it found no good reasons to disallow the project.

Government decision is expected sometime next month so preparations can be made this winter for a big blast in February or March.

▼ ▼ ▼

Egyptians may one day assume managerial control of oil production and exploration in the entire Middle East.

The reason: One of Egypt's greatest assets now is an educated managerial elite. That explains why Egyptians can manage Suez canal and their own oil production and refining.

Egypt should soon be able to furnish the management talent needed by other Arab nations. These are conclusions from world-wide management study made by Drs. Frederick H. Harbison of Princeton and Charles A. Myers of M.I.T.

Dynamic new premier, London-trained economist and publisher, Pedro G. Beltran, is putting both Peru and its oil industry on their feet.

He survived his first move, decreeing higher product prices. As result, country appears to be moving out of economic morass. Oil industry also is moving off dead center (p. 82).

▼ ▼ ▼

Two interesting drilling developments:

...Zapata Petroleum Corp., recording a $32,969 loss on its drilling operations the first half, is selling its rigs and quitting the contract drilling game. Company now will devote energy to oil and gas production, will spend its cash from drilling assets to acquire and develop natural gas production, primarily in Alberta.

...Helmerich & Payne, Inc. reports its contract drilling activity is up 58% over year-ago levels. This means high

start up costs and lower cash flow first half but improved profits the fourth quarter.

Ebullient-cooled engines are now making their debut in drilling-rig service, after having proved themselves in many pipeline and marine services.

Great Western Drilling hopes to get longer and more trouble-free service from its drilling engines in which jacket water boils (p. 103).

▼ ▼ ▼

A prolific gasser has been brought in by United Producing Co., Inc., in West Virginia's Cabin Creek district of Kanawha County.

The well flowed 40,700 M.c.f. daily on 5½-in. producing string after fracture. Total depth is 2,173 ft. The United well is the seventh producer in Paint Creek field which now has three more wells drilling and two staked.

Look for more Devonian reef hunting in northwestern Alberta's Clear Hills region as Shell evaluates the province's best gas find of the year at its Worsley wildcat.

This test in the Peace River fringing reef or D3 zone of the Devonian got up to 8,000 M.c.f. daily. This important strike is 73 miles northwest of Peace River town.

Shell has added another gas area to the Alberta foothills region, 55 miles northwest of Calgary and 10 miles northeast of Panther River field.

Shell's Burnt Timber wildcat during tests flowed 2,000 M.c.f. daily from a 100-ft. interval below 11,205 ft. Production is from Mississippian.

The wildcat is another link in the chain of deep gas fields building up along the foothills belt of the Rockies and is the 15th mountain front field in Alberta alone.

A rank Arbuckle oil discovery in southwestern Oklahoma's Comanche County, 65 miles west of similar production, will stir wildcat drilling in the Wichita Mountain area.

Continental Oil completed the 1 Mansel near Fort Sill for 203 bbl. of oil per day through choke with 1,190 M.c.f. daily of gas. Pay is from deep Arbuckle Cambro-Ordovician perforations below 9,100 ft.

The new pool opener is on the extreme south fringe of the Anadarko basin in the highly complex mountain-front area. Nearest Arbuckle oil is in Hoover area to the east in Murray County in the Pauls Valley uplift region.

One of Canada's biggest gas reserve areas also may produce a depth-record well for the nation.

Shell will drill a deep pool test in Waterton Park gas

field in extreme southwest corner of Alberta. Plans call for a 16,500-ft. well to test Devonian. At this depth it will break record set in 1958 by Texaco et al. Simonette which went to 15,283 ft. Production in Waterton Park field is from the Mississippian.

▼ ▼ ▼

OCAW officers will ask union's international convention in Cleveland next month for authority to step up organizing campaign and build up a larger defense fund for the future.

Special extra assessment will be asked for the defense fund to aid members on strike. Organizing drive will be financed by stripping other union services to the bone, shifting staff members into the new work.

OCAW contract with Cities Service for employes manning service stations on Ohio Turnpike provide wages ranging from $350 to $425 monthly.

Other provisions: 45-hour, 5-day week with 2 consecutive days off; overtime after 9 hours; time and one-half pay for work on scheduled days off; eight paid holidays with double-time-and-one-half if worked; paid vacations; extra premium for night and early morning work.

▼ ▼ ▼

Steelmakers face a dilemma over their oil-country business, according to Steel Magazine.

The problem: Should distributors who supply small oil operators with steel get priority when tubular goods again are available? Or should steel men concentrate on direct shipments to big users?

Major oil companies jumped advertising budgets last year by nearly 7% over 1957 outlays.

Seven oil firms were in the top 100 national advertisers in a survey of Advertising Age.

Leading the oil list was Jersey Standard, spending $23 million or 0.3% of sales. Then followed Indiana Standard with $19 million or 1% of sales, Texaco with $18 million plus or 0.8%, Shell $16 million plus or 1.0%, Gulf $12 million plus or 0.4%, Mobil nearly $12 million or 0.2%, and Sun $9 million plus with a hefty 1.3% of sales.

▼ ▼ ▼

Oral arguments in Phillips gas case, coming up Oct. 1, will reveal one fact: Big gas buyers dislike the method of setting producer's prices as recommended by FPC Examiner Joseph Zwerdling (p. 57).

Many of the buyers who fought so hard to have producers regulated strictly on a public-utility formula are now bitterly disappointed with the first test case.

Bovaird OPENS NEW SERVICE CENTER NATCHEZ, MISSISSIPPI

TO GET WHAT YOU WANT . . . WHERE YOU WANT IT . . . WHEN YOU NEED IT . . . AT REASONABLE COMPETITIVE PRICES

OFFICES AND STORES

ILLINOIS — Carmi, Clay City, Mt. Vernon, Salem
KANSAS — Chase, Great Bend, Liberal, Pratt, Russell, Wichita
LOUISIANA — Shreveport
MISSISSIPPI — Natchez
NEW MEXICO — Farmington, Lovington
OKLAHOMA — Duncan, Oklahoma City, Pauls Valley, Sapulpa, Tulsa
TEXAS — Abilene, Amarillo, Borger, Dallas, Houston, Midland, Odessa, Pampa

SUPPLY BOVAIRD COMPANY

"Buy From Bovaird"

THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

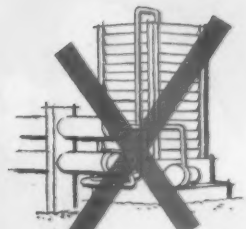
88 YEARS OF PROGRESS WITH THE OIL INDUSTRY

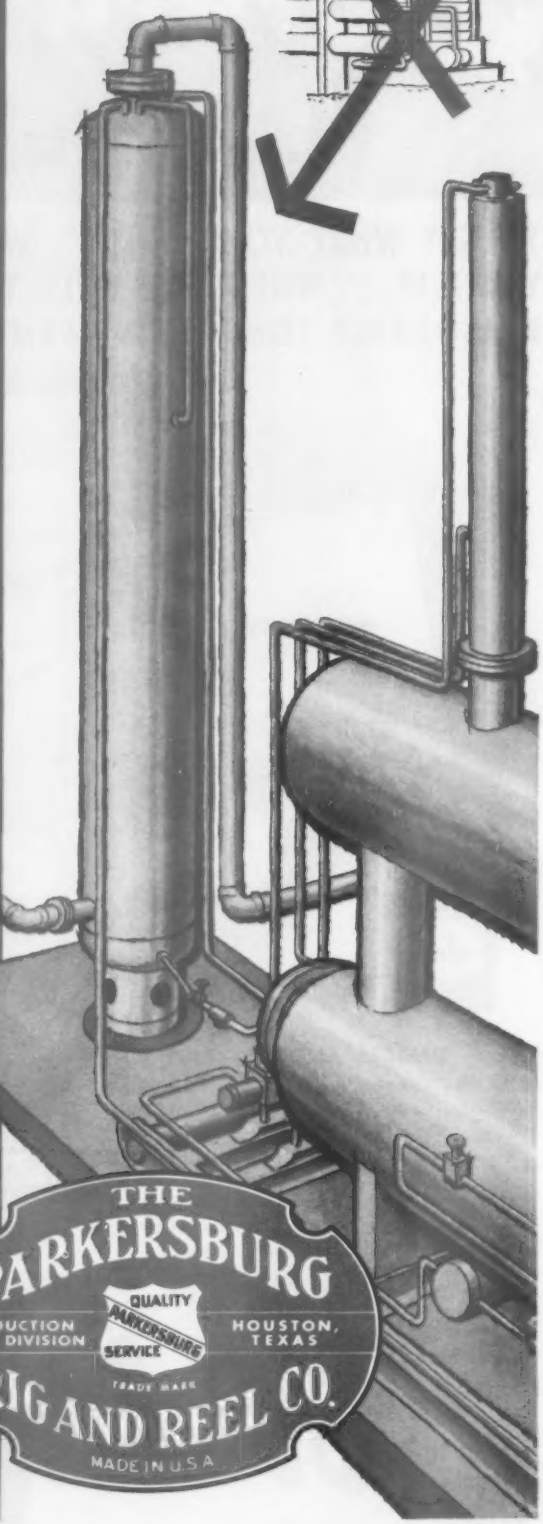
HOT GAS

DEHYDRATED TO PIPELINE SPECIFICATIONS

without costly after-cooling equipment

BY PARKERSBURG'S EXCLUSIVE HI-TEMPERATURE SUPER DRYER GLYCOL-TYPE DEHYDRATION UNIT





THE PARKERSBURG RIG AND REEL CO.

PRODUCTION EQUIP. DIVISION

QUALITY PARKERSBURG SERVICE

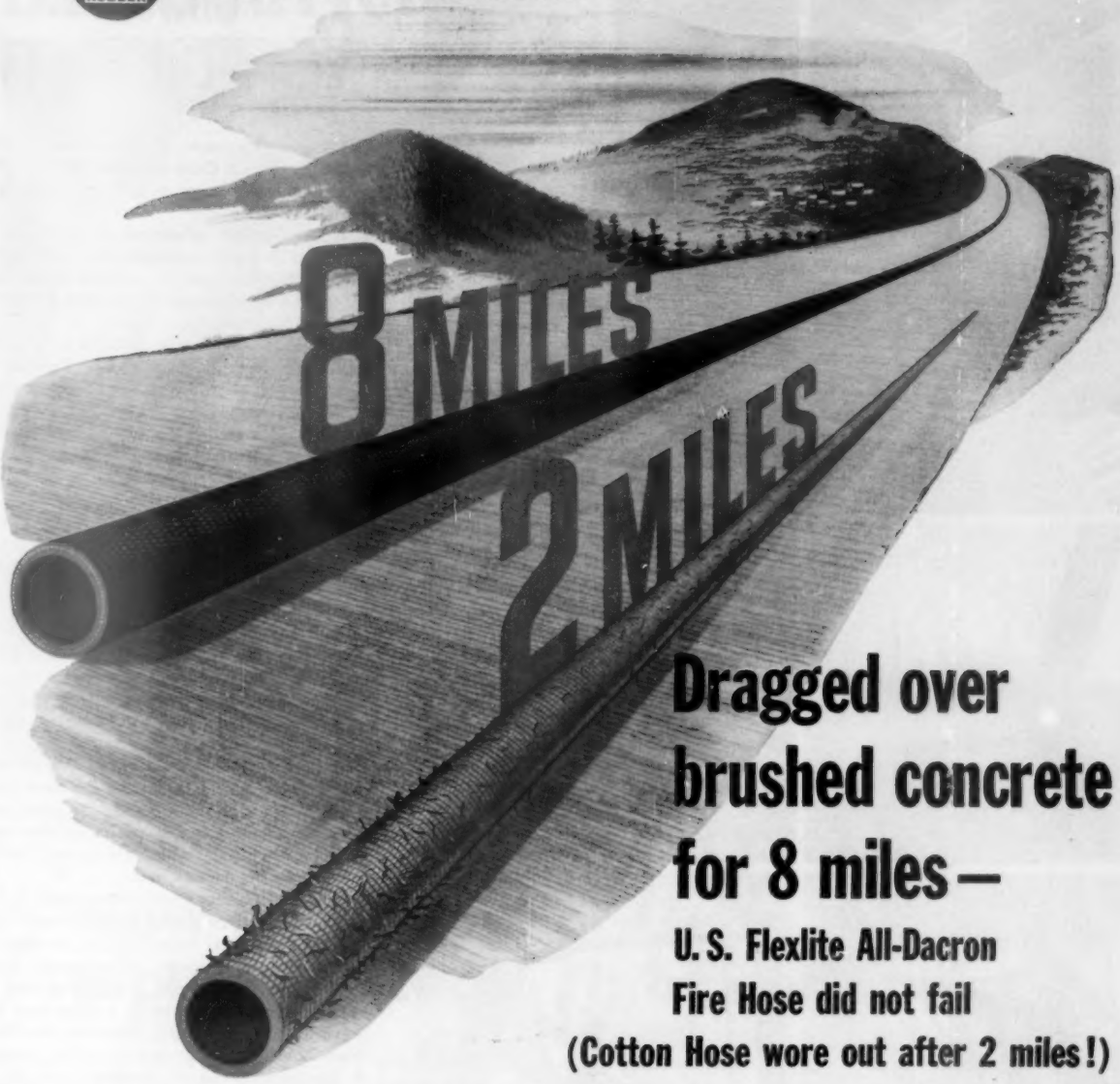
TRADE MARK

HOUSTON, TEXAS

MADE IN U.S.A.

PESA

FLEXLITE ALL-DACRON FIRE HOSE



Dragged over brushed concrete for 8 miles—

U. S. Flexlite All-Dacron Fire Hose did not fail

(Cotton Hose wore out after 2 miles!)

This test convincingly proves the overwhelming ruggedness of Flexlite® Hose. It demonstrates, too, that a hose can be rugged and at the same time light and *flexible*. Flexlite's lightness enables fire crews to fight fire without being hampered by excess weight.

U. S. Flexlite Hose brings you these other advantages: It won't absorb water and hence can't freeze. It is highly resistant to oils and chemicals. Every foot is subjected to five hundred pounds test pressure before leaving the factory.

This hose comes in any color for ready identification as a fire hose. This prevents its being carried off or utilized for purposes other than fire fighting.

• • •

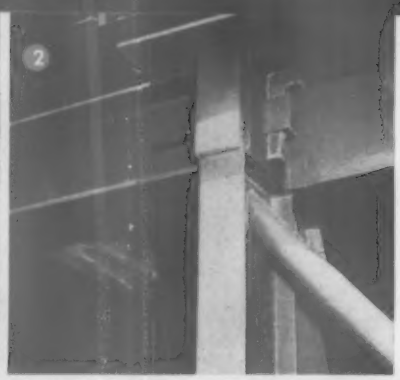
When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

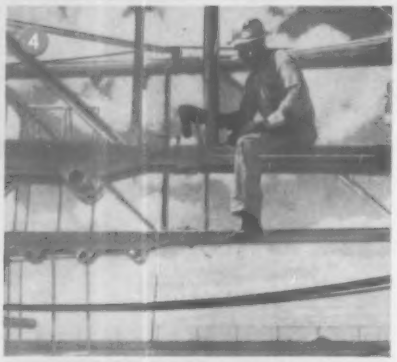
Mechanical Goods Division

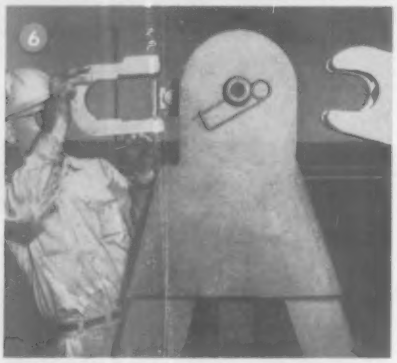
United States Rubber

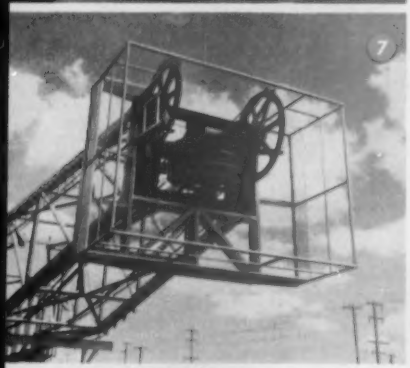
WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.









SEE . . . how exclusive features cut rig-up time on

"Oilwell" Lever-Lift Masts

1. The mast consists of five sections, which nest together on three trucks as shown. With substructure it moves anywhere in five truck loads.

2. When outside substructure sub-bases are unloaded on location, swaged pipe spacers drop easily into place and top spacer beams, with patented wedge-lock fasteners, snug beams and columns together.

3. The mast hinge frame atop the substructure is held securely in position by threaded tee-fasteners, self-contained in the upright columns of the substructure.

4. Patented mast-leg-lock connectors are used instead of bolts in assembling the mast sections at ground level. Leaf spring with nut handle holds each wedge securely in place.

5. Eccentric hinge pins (patent pending) pivot the tubular raising levers from the base corners of the substructure and keeper pins engage to maintain desired position.

6. Hinge pins atop the substructure are positioned in front of the draw works to provide over 480 sq. ft. of safe working space for the crew. The forked end of the mast moves into position under draw works power, and is secured by U-shaped fastener with locking bolt and nut.

7. Patented cross-over crown block runs the fast line and dead line outside the mast, equalizing leg loads and minimizing torsional strain. This arrangement also positions the traveling block with flat side facing and fast line away from the derrick man.

8. Patented raising system minimizes fast line pull from the draw works. Lifting levers (which become front legs) actually push the mast into upright position where an automatic spring-loaded wedge-lock, with over-travel stop, prevents the mast from being pulled over backward or falling forward. This lock must be released by hand before mast can be lowered.

9. The mast is quickly centered over the well by adjusting hinge pins in the two mast legs and the two lever legs. One man turns the eccentric pin while the other inserts a keeper at the desired position.

10. Owners agree that Lever-Lift Masts load and unload fast . . . go together fast . . . and tear down fast. They're designed to save you time and money. Contact your nearest "Oilwell" or Wilson Supply Company representative for the full story . . . or write for information.

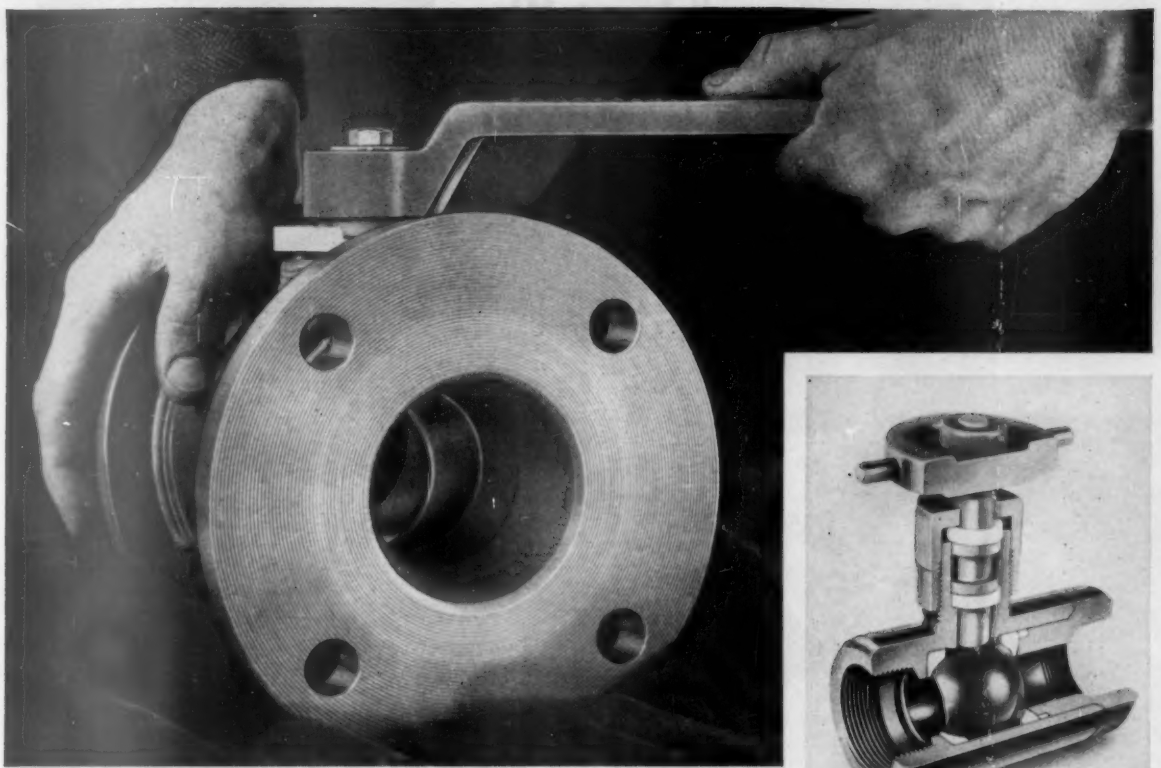
USS and "Oilwell" are trademarks

USS **Oil Well Supply Division of United States Steel**

Executive Offices—Dallas, Texas
Export Office—30 Rockefeller Plaza, New York 20 N.Y.

News about

B.F.Goodrich Chemical *raw materials*



Valves by Jamesbury Corp., Worcester, Mass. Geon rigid vinyl parts molded by Mannesman-Easton Plastic Products, Inc., Easton, Pa. Valves in sizes from 1/2" to 4", shown in large photograph, are rated at 150 psi to 100 F. and at 50 psi to 130 F. They can be remote operated. B.F.Goodrich Chemical Company supplies the Geon rigid vinyl material only.

New ball valve of Geon helps piping systems fight corrosion

Thousands of test cycles with this new valve made from Geon rigid vinyl have proved the effectiveness of its seal, either at full pressure or vacuum. Since it is made entirely of Geon except for seats and seals, it offers pipe users another weapon for the battle against corrosion. Geon offers superior resistance to oils, acids, alkalies and most chemicals.

In addition, rigid Geon weighs less than metal. Shipping weights are lower, installation is easier. These valves can be obtained with threaded ends, weld ends, or flanges. They are self-compensating for changes in pressure or temperature. There is no problem of galling or seizure. No lubrication is needed.

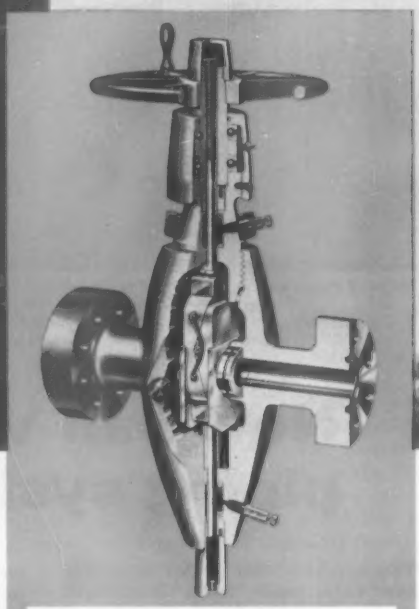
Geon offers remarkably varied opportunities for products that open new markets or improve present applications. In rigid form it is being used for pipe, window frames and ductwork . . . in other forms for weatherstrip, wall coverings, foam products, or coatings for metal, paper or textiles. One member of the Geon family can surely help you make a better product. Write for information to Dept. AN-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

"Just like power steering . . . at 11,600 psi!"



W-K-M® Balanced Stem Valves

These valves are the easiest operating high pressure valves ever made.

Only W-K-M Balanced Stem Valves are designed to overcome the heavy thrust loads carried by bearings and threads in single stem valves. A second stem is attached to the bottom of the gate to balance out body pressure that acts against the operating stem. The only loads to be overcome in opening or closing this valve are packing friction and normal operating loads.

Next time — and every time — specify W-K-M! *Available at leading supply stores everywhere.*

PRODUCT OF W-K-M's *Creative Engineering*

WRITE FOR CATALOG 200

W-K-M Division of
ACF Industries, Incorporated
P. O. Box 2117, Houston, Texas

W-K-M
SERVING INDUSTRY 40 YEARS

W-K-M Balanced Stem Valves feature through-conduit gate construction, parallel expanding gates, controlled force seating, pressure seal bonnets, super-finished stems supported on roller bearings, seating surfaces sealed away from the lading flow.

Sizes: 1-11/16" through 2-9/16".

Working Pressures: 10,000 and 15,000 pounds.

Write for Test Bulletin WP-1058. It describes how this superlative valve successfully passed the oil industry's most punishing tests.

5912

FORMATION PACKER SHOE
OPERATING DIAGRAM

CEMENT YOUR FUTURE... WELL!

WITH THESE HALLIBURTON CEMENTING TOOLS

HALLIBURTON FORMATION PACKER SHOE AND COLLAR used in casing cementing helps to protect exposed low pressure formations or any formation below the casing... minimizing subsurface problems... helping to attain maximum future oil production.

Halliburton Formation Packer Shoes offer these outstanding advantages when installed on the first joint of a string of casing:

- Helps protect the pay zone from cement contamination in low-pressure formations while cementing, as Packer when expanded packs off open hole below casing.
- Floats in and guides the casing to bottom.
- Halliburton Super-Seal Back-Pressure Valve above slotted cementing ports helps keep cement slurry in place with no backing-up inside the casing.
- Circulation of fluids is provided through end of Shoe until shoe packer rubber is expanded and set.

This Formation Packer Shoe is used in all areas where conditions require casing to be set on top of producing formation. All internal parts are constructed of high impact phenolic plastic for fast, easy drilling.

Halliburton Formation Packer Collar is similar in design, casing size, hole size, application and setting operation to the Formation Packer Shoe... providing multiple uses in cementing casing.

- Installed on casing above shoe joint, helps protect a lower formation from cement contamination while cementing.
- Several joints of casing or liner may be installed on lower end of Packer Collar; packer is set and cement pumped down casing and out through slotted cementing ports into annulus above expanded packer.
- Used in setting liners, perforated pipe and screen in salt water disposal wells, water flooding projects and in fields where "Full Hole" cementing is desirable.
- Designed to support 40, 400 to 114,000 lbs. suspended below packer collar depending upon O.D. size required.

FORMATION PACKER SHOE
CASING SWIVEL

Put your well on a solid foundation... specify Halliburton Formation Packer Tools to help solve specific problems in oil well cementing. Write for a copy of new brochure number S-8025.

HALLIBURTON SPECIAL PLUG AND BAFFLE SET... may be placed one or more joints above Packer Shoe in a Casing Collar in the string to stop the top cementing plug. A Special Bottom Plug is pumped down through the Baffle to Setting Cage and applied pressure ruptures the plug diaphragm to establish circulation through plug and cementing ports... Top plug is pumped down on top of the cement slurry and shut-off on the baffle.

HALLIBURTON CEMENTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"A WELL WORTH CEMENTING IS WORTH CEMENTING WELL"

for PRODUCTION SECURITY
specify LUFKIN . . .

IT'S CHEAPER TO BUY THE BEST
. . . *and avoid that costly "down-time"*

You Can Relax When Your Lease Is **LUFKIN EQUIPPED**

PLENTY OF "BEEF" WHERE IT COUNTS THE MOST

Long years of experience have proven the absolute necessity for the generous factors of safety designed into the gears, shafts, bearings and structural members of LUFKIN UNITS

Lufkin **FOUNDRY & MACHINE COMPANY**

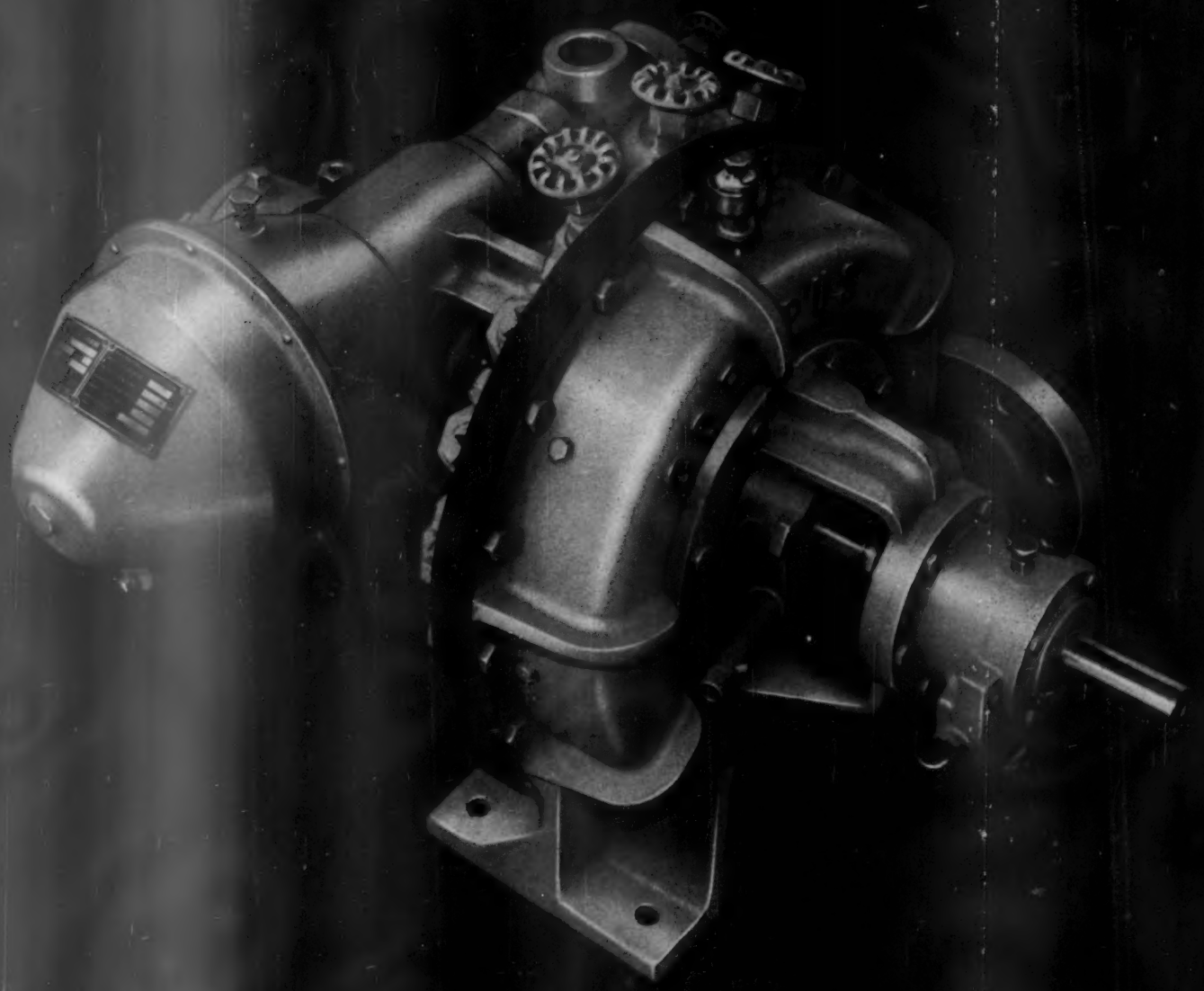
LUFKIN, TEXAS

Branch Sales and Service: Houston • Natchez • Corpus Christi • Lafayette • Dallas • Kilgore • Odessa • Hobbs • Oklahoma City Shreveport • Wichita Falls • Los Angeles • Bakersfield • Effingham • Casper • Denver • Sidney • Great Bend Midland • Farmington • Seminole • Tulsa • New York • Pampa • Sterling • Maracaibo, Venezuela

Lufkin equipment in Canada is handled by

THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada

COPPUS BLUE RIBBON PRODUCTS



Coppus Horizontal Steam Turbine

NEW RUGGED DESIGN—BLUE RIBBON RELIABILITY! Here's a new dimension in turbine performance! Coppus brings you a new rugged stability of design . . . a new measure of reliability in a complete range of power-packed turbines, from 1 HP to 250 HP — marked with the Blue Ribbon only after each is precision made . . . precision tested. Performance features like these assure you Blue Ribbon Reliability —

A totally enclosed governor . . . totally enclosed, independently operated safety trip . . . easily replaceable packing and bearings . . . multiple steam nozzle control . . . brake rim for added safety . . . wide bucket "L" type wheel (optional) for minimum water rate.

Coppus Turbines are built to customers' specifications, including API and NEMA standards. All Coppus Products carry the same Blue Ribbon assurance of reliable performance. For further facts on turbines, send for new Catalog 200. COPPUS ENGINEERING CORPORATION, 269 Park Avenue, Worcester, Mass. Sales Offices in *Thomas' Register*.

COPPUS
STEAM TURBINES

You can depend on purchased electric power for

LOW COST PRODUCTION

Two electrified pumping units working together in West Texas

Economies of purchased electric power have been proven time and again for producers who have learned to depend on utility service in their fields. Saving in manpower and adaptability for automatic control makes utility electric power ideal not only for production but for gathering, pipeline and refinery operation. See your nearest utility electric power company for details or write the Petroleum Electric Power Association.

Purchased Electric Power . . . saves money; manpower; maintenance; and serves you better automatically

Petroleum Electric Power Association

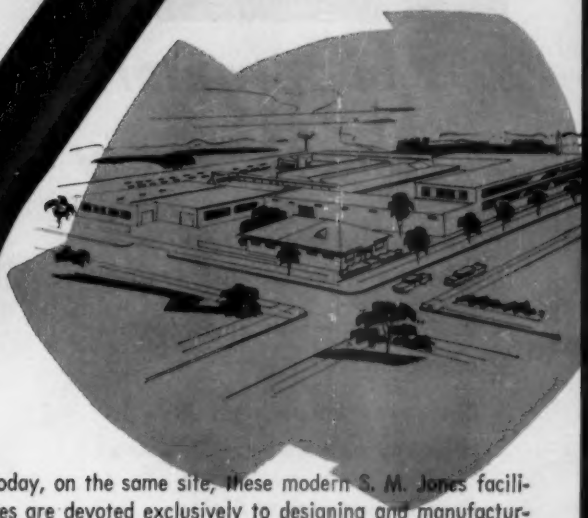
P. O. BOX 35006, DALLAS 35, TEXAS

JONES

FIRST IN 1894...

S. M. Jones produced the first all-metal sucker rods in 1894 under the name of the Acme Sucker Rod Company in Toledo, Ohio...

FIRST TODAY...



Today, on the same site, these modern S. M. Jones facilities are devoted exclusively to designing and manufacturing the finest sucker rods in the world.

...because we're Sucker Rod Specialists!

There are four
JONES JOB-ENGINEERED SUCKER RODS...
a type for every pumping need!

THE S. M. JONES COMPANY

Division of Buffalo Eclipse Corporation

General Office and Factory: TOLEDO, OHIO

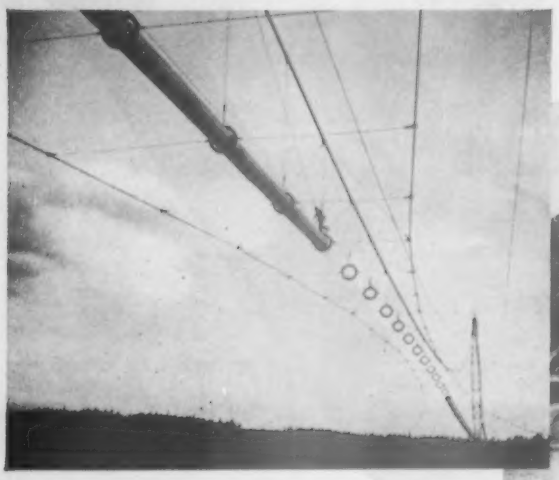
Sales Office: Enterprise Building, TULSA, OKLAHOMA

Export Sales Representatives:

IDECO, One of the Dresser Industries, Dallas—New York

Franklin Supply Company, Export Division, Inc., New York

CLAYMONT
API large O.D. PIPE



. . . overhead

underwater. . .

. . . and for every standard or special use

- **Natural Gas or Crude Oil Transmission Lines (High Pressure)**
- **Low Pressure Gas Lines (within urban limits)**
- **Casing or Encasement Pipe for Highway and Railway Crossings**
- **Compressor Station Piping**
- **River Crossings (Heavy Type)**
- **Gas and Oil Storage Lines**

Widespread usage in these and a host of other applications clearly indicates customer confidence in Claymont's ability to produce top-quality welded steel pipe of all kinds to API and various other specifications.

Claymont, located on the Delaware River, with major dock facilities nearby, is ideally situated to ship by water to foreign and Gulf Coast producing centers. In addition, Claymont is also located on the main line of a major railroad.

Claymont produces its own steel, rolls its own plate, and has complete facilities for making large diameter API Pipe. Standard sizes from 22″ to 36″ O.D. and special sizes to customer specifications can be supplied. Claymont Pipe, regularly shipped in 40′ lengths, can also be supplied in 20′ or special lengths.

Realizing that economy is of paramount importance in pipelining, Claymont is now geared to produce pipe to API-5LX56 specification, thereby enabling you to reduce wall thickness and weight.

At the end of each rolling, we overrun adequate quantities of pipe to service our customer's quick-delivery requirements from stock. When you need large diameter pipe of any kind, for any use, check Claymont first.

CF&I STEEL

OTHER CLAYMONT PRODUCTS: Carbon Steel Plates • Alloy Steel Plates • High Strength Low Alloy Steel Plates • CF&I Lectro-Clad Nickel Plated Steel Plates • Flanged and Dished Heads • Manhole Fittings and Covers • Fabricated Steel Plate Products

Claymont Steel Products

THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Odessa • Oklahoma City • Phoenix • Portland (Ore.) • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Tulsa • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

CF&I OFFICE IN CANADA: Montreal • CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

6544-A

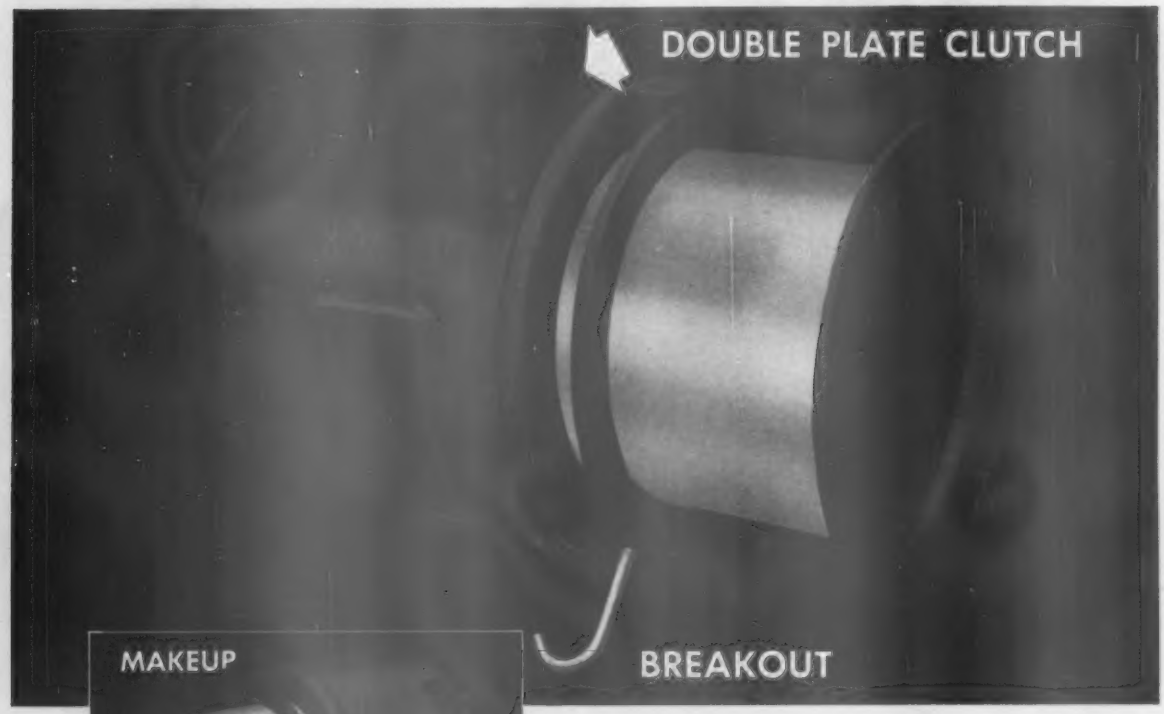
Top performance, high efficiency and less maintenance are factors which influence the selection of a short coupled pump. Layne Vertical Service Pumps fulfill these requirements and offer the advantages of lower installation and operation costs, low submergence requirements, simple alignment, no priming and less floor space demands. For any short coupled pumping job . . . specify Layne.

Write For Free Bulletins:
LAYNE TURBINE TYPE SERVICE PUMPS—NO. 300
LAYNE PROPELLER AND MIXED FLOW PUMPS—NO. 350

World's Largest Layne Water Developers

LAYNE & BOWLER, INC., MEMPHIS
General Offices and Factory, Memphis 8, Tenn.
LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD
SALES REPRESENTATIVES IN MAJOR CITIES

You get MORE POWER with the AMERICAN IRON Universal "55" Cathead!



REMOVABLE STEEL SPOOL
More road clearance.

You have POWER to spare, with the double plate clutch on the American Iron Universal Model "55" Catheads—power to properly make-up or breakout any size tool joint connection.

There are many other outstanding advantages of the American Cathead. The safety features of the stationary guard and the rope divider, which is mounted on the safety guard, are important.

You'll like the simple, quick installation, and the compact, rugged construction with a minimum number of wearing parts. These are just a few of the reasons why you buy quality when you specify AMERICAN IRON.

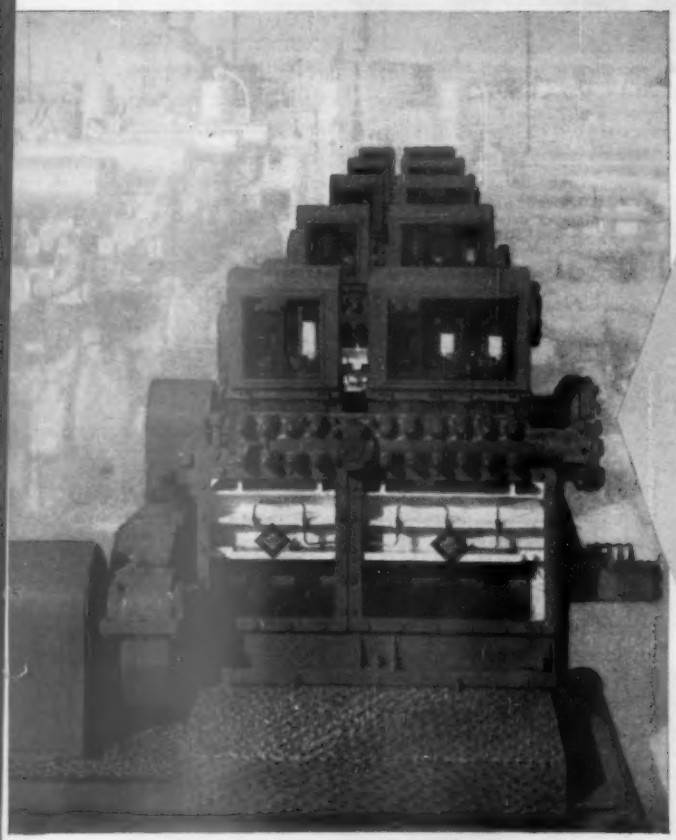
Available Through Your Supply Store!

AMERICAN IRON

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

UNDER NORMAL CONDITIONS . . .

Any Good Pump will do the Waterflood Job



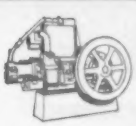
"Five Ajax Quintuplex pumps on Long Beach project."

. . . but Ajax builds in anticipation of troublesome suction conditions—water hammer—excessive loads—high stress, fatigue causing conditions . . .

Thus an Ajax pump reduces down time and increases "ON THE LINE" pumping time.

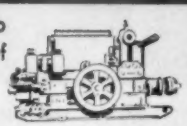
- Streamlined discharge manifold — reduces turbulence
- Double row tapered permanently factory adjusted roller main bearings result in lowered maintenance cost.
- "Safety Link" Tie Rods — protect vital components during highly abnormal conditions

AJAX OIL FIELD PUMPS



ENGINES

AJAX also builders of



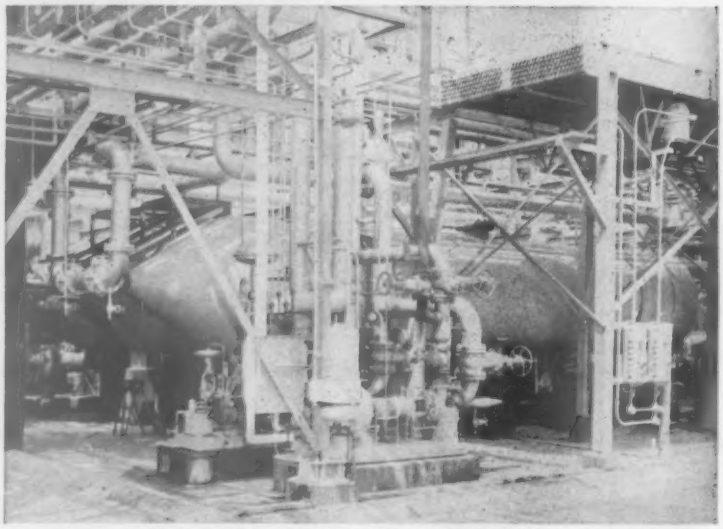
COMPRESSORS

AJAX IRON WORKS CORRY, PENNSYLVANIA

OIL FIELD DISTRIBUTORS: The National Supply Co., Pittsburgh, Pa.
Bethlehem Steel Company, Supply Division, Tulsa, Oklahoma

Nalfining: Unique New Upgrading Method for Low-Cost Processing of Distillates

Contaminants Problem Solved without Major Investment; with Minimum Attention and Control Procedures



Three process vessels, operating in parallel, Nalfine 3,000 bpd of cat. cracked gasoline.

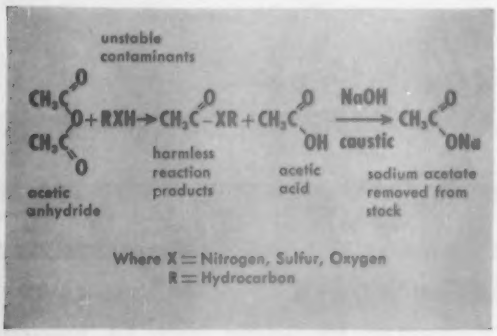
Improvement of color, stability and odor of distillates through Nalfining changes the entire economic aspect of treating processes. Instead of equipment installation costs ranging from $150 to $300 per barrel of throughput capacity, Nalfining installations run from 50¢ to 75¢ per barrel of capacity!

Processing costs with Nalfining offer almost as startling economies . . . First, because Nalfining makes possible a wide range of process variation without affecting upgrading results: testing, control and personnel training requirements are minimized . . . There are no disposal problems with Nalfining . . . And chemical costs range from 3 mils/barrel on low sulfur stocks to 3¢ to 5¢/bbl. on sour gasolines and oil stocks.

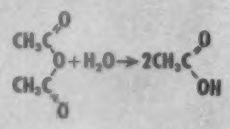
Simple Basic Process

Nalfining makes use of the interaction between acetic anhydride and unstable, reactive components in light fractions to produce harmless, unreactive, odorless compounds which do not precipitate or cause product losses.

While the complex chemical nature of components in most stocks make definite identification of reactions difficult, the following reaction offers a possible explanation of how the process functions:



Nalfining is also effective with fuels containing water haze following distillation. Apparently this is possible because hydrolysis of acetic anhydride proceeds at a slower rate than the primary reaction.

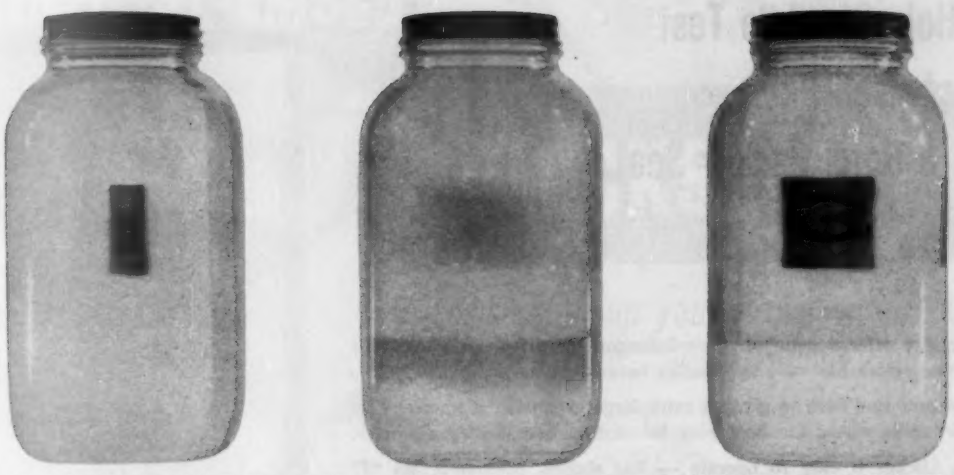


Equipment Costs Low

Installing the Nalfining process is much less costly than that for most refining processes because the required equipment is very simple, and expensive instrumentation and control costs are eliminated. Successful Nalfining installations have been set up by utilizing process vessels or tanks formerly used for caustic or acid treating operations. Aluminum storage tanks, pumps and lines to handle acetic anhydride are normally the only new equipment necessary.

Few, Simple Process Controls

Day-to-day control of Nalfining consists of simple tests to check reagent concentrations, completeness of reactions, and treated product quality. Other than these few tests, which can be made with equipment readily available in any control laboratory, and minor adjustments for operation, there are *no* other personnel needed for Nalfining . . . With reliable pumps and equipment, process upsets *do not* occur.



Jar at left (1) is raw fuel oil. Center jar (Numeral 2 obscured) is same oil with caustic added. Note haze in oil and "rag" of impurities extending from oil-caustic interface into caustic. Jar at right (3) was treated with both acetic anhydride and caustic. Stock is clear, there is no "rag" or residue at oil-caustic interface, and stabilized product will stay clear, free of objectionable odors through storage, shipment and trouble-free use.

Nalco Service Provided

All Nalfining units are provided with the regular services of Nalco Technical Representatives, who conduct tests and take samples to provide detailed information on process effectiveness, unit performance and quality of finished product. Regular reports are made to refinery personnel.

Nalfining a Wide Range of Products

Experience to date with Nalfining proves successful, low-cost upgrading of heating oils, solvents, jet fuels, gasolines, kerosenes and other distillate stocks. Throughput volumes today range from laboratory pilot plant operations to 20,000 bpd processing of light cycle oil. Nalfining itself is capable of volume of throughput equal to any desired rate.

Thorough Products "Cleanup"

Nalfining does a thorough job of deactivating distillate contaminants. Mercaptans are converted to unreactive, odorless chemicals. Unstable nitrogen, sulfur and oxygen-containing impurities are stabilized to harmless, oil-soluble reaction products.

Nalfined products have no reactive tendencies which would promote color degradation or sludge formation. No emulsion-forming occurs with water or caustic; and the Nalfined effluent has negligible sodium content.

Complete Data Available

Nalfining is a patented process which is offered under license agreement to refiners. Complete data on the process are available upon request from Nalco and we will welcome the opportunity to discuss a license agreement with you.

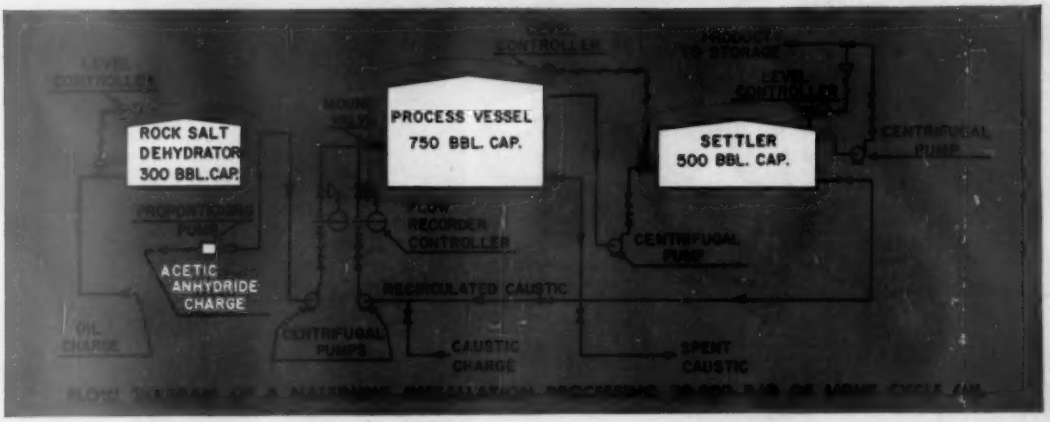
National Aluminate Corporation is now

NALCO CHEMICAL COMPANY

6242 West 66th Place • Chicago 38, Illinois

In Canada—Alchem Limited, Burlington, Ontario
Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany

Nalco® ... *Serving Industry through Practical Applied Science*



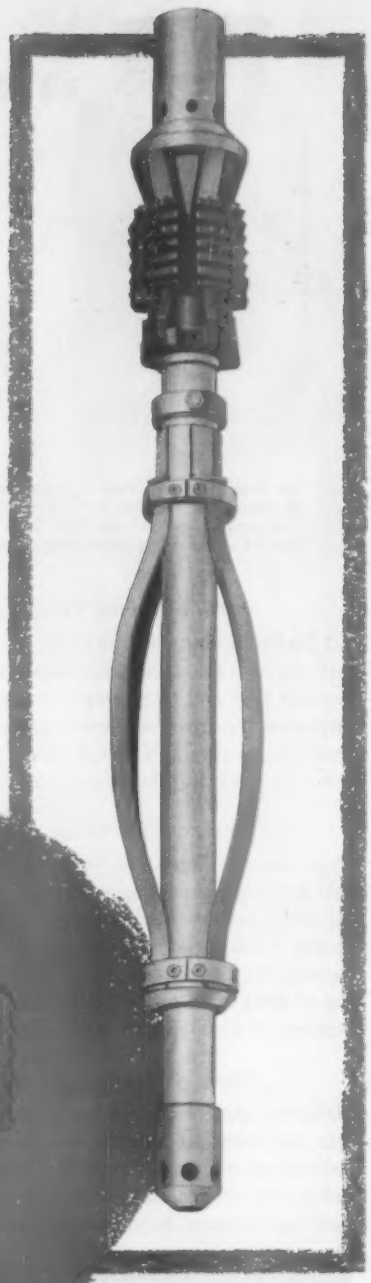
To Open-Hole Straddle Test
Eliminate Tail Pipe
Insure a Good Packer Seat

specify the new Johnston Open-Hole Anchor

Many advantages are offered with this New Johnston Open-Hole Anchor. This is a slip-type device which has wide application because of its flexibility.

The slips are designed and built to give an extra large expansion diameter. This insures seating in wells where the hole may be slightly over drilled diameter.

The Open-Hole Anchor is easy to operate — has simple, positive-action "J" setting. A spring locking nut, incorporating buttress threads, allows easy re-setting of the anchor. When testing is completed, 6 turns to the right allows you to rotate out of the hole.



THE PROOF---

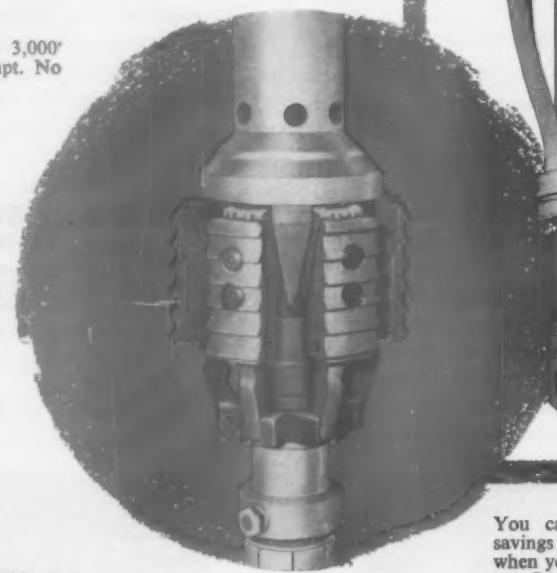
Hansford County, Texas
Conventional test at 8800′ in 7⅞″ hole. Used Anchor and single Bob Tail Packer only. No tail pipe. Mud weight 9.8 lbs., estimated 120,000 lbs. on packer and setting tool. No slipping of tool, no problems. Test successful.

Hansford County, Texas
Straddle test in 7⅞″ hole between 3,000′ and 4,000′. Anchor set on first attempt. No wash pipe used. Test successful.

Hansford County, Texas
Straddle test in 7⅞″ hole between 6,000′ and 7,000′. Tool set on first attempt. No wash pipe used. Test successful. Second test run between 5,000′ and 6,000′. Packer failed to seat in washed out hole. Moved up hole, tool and packer set on first attempt.

Hansford County, Texas
Straddle test in 7⅞″ hole between 5,000′ and 6,000′. Tool set on first attempt. No wash pipe used. Test successful.

Liberal, Kansas
Straddle test between 5,006′ and 5,016′. Tools worked well. No trouble. No wash pipe used. Test successful.



Liberal, Kansas
Selective zone tests between 3,907′ and 3,915′ and 4,672′ and 4,680′. No problems encountered. Tools worked perfectly. No wash pipe. Test successful.

Liberal, Kansas
Two straddle tests run between 4,662′ and 4,678′ and 4,577′ and 4,614′. Both tests O.K. No trouble whatsoever. Tools worked as expected. Test successful.

Eliminates the need for tail pipe on conventional tests and straddle tests.

Offers flexibility in finding packer seat. If seat is not obtained on initial attempt just pick up and re-set the tool.

You can profit from the savings in dollars and time when you specify the Johnston Open-Hole Anchor. Ask your Johnston representative for full information. You'll be glad you did.

JOHNSTON DRILL STEM TESTING TESTERS

P.O. Box 98, Houston 1, Texas

CONTINENTAL-EMSCO

BLOCKS and SWIVELS

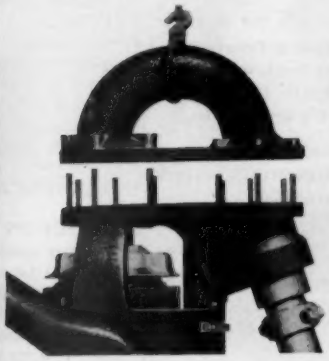
brighten up your profit picture with quick trips.. less trouble.. long life

Right up to the minute streamline design provides the proper balance for Continental-Emsco straight and fast-falling MA and RA series blocks.. low center of gravity design increases working height in the mast.. lets block ride higher in the mast for greater clearance at derrick floor. Reversible cartridge allows lubrication of sheave bearings from either side.

HERE'S WHERE YOU GAIN EXTRA RUNNING MILES FROM WIRE ROPE

Note the flame-hardened surface of the sheave grooves. This keeps their surface smooth and long wearing.. no scored surface to cut and shorten wire line life.

Continental-Emsco L series swivels are made to handle the high mud pressures of today's drilling.. and yet are light enough not to bend the kelly in its rat hole. They are short with ample hook clearance and are simple in design for quick .. easy maintenance.



ROTARY HOSE IS NOT DISTURBED WHEN REPLACING PACKING OR WASH PIPE

This design feature cuts down-time, since rotary hose does not have to be disconnected to change packing or wash pipe.. packing is a one-piece unit which also speeds-up replacement.

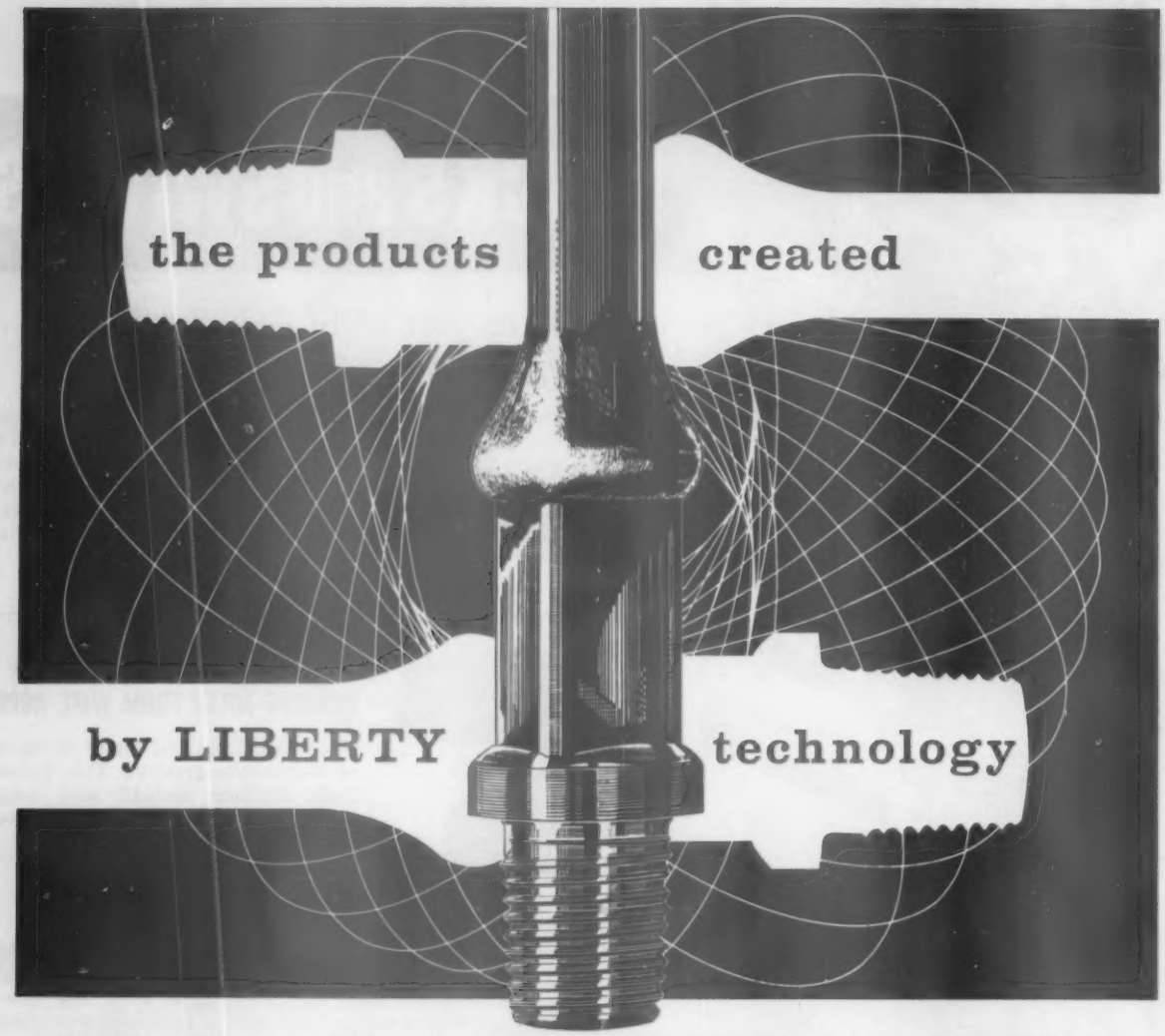
For Service that Sings.. Equipment that Hums.. Go..

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

DA 90

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts., England
Representatives in All Principal Oil Fields of the World



Daily Show Their EXCELLENCE in the Field

Save 10% to 33⅓% on pumping from low fluid-volume wells to 5,000 feet, with the LIBERTY ¼-INCH SUCKER ROD - the newest product of LIBERTY technology.

To get complete information on the LIBERTY ¼-INCH SUCKER ROD, send today for technical information.

All LIBERTY products are sold only in Supply Stores, through the LIBERTY SERVICE NETWORK.

There are many reasons for the excellence of LIBERTY SUCKER RODS and PUMPING UNITS but there is only one final proof: the performance which LIBERTY products give in day after day of hard field use.

In this way, LIBERTY SUCKER RODS and PUMPING UNITS have been serving the oil production industry for over 40 years, in every kind of pumping condition.

LIBERTY Field Representatives bring the same quality of excellence, in their training and experience, to assist you in designing installations for maximum efficiency in your pumping operations.

To learn more about LIBERTY products and services, write or call -

LIBERTY

MANUFACTURING COMPANY OF TEXAS

4025 HEMPHILL STREET • FORT WORTH, TEXAS

LM-9

anti-stalling
anti-rust

GULF agent 178

Your customers have sure protection against carburetor icing when you stall-proof your gasoline with Gulf Agent 178. For more than four years, this additive has proved itself in millions of cars and billions of miles of service. Gulf Agent 178 is easy to use, because it is readily soluble in all petroleum products and blends easily at temperatures from minus 30° to plus 140° F. It is insoluble in water and can be used in conventional gasoline transfer systems with no danger of loss from water leaching. Gulf Agent 178 is inexpensive, too. Only 10 to 15 pounds are required per thousand barrels of gasoline. No expensive storage space is required, since quantities are so small. Lastly, Gulf Agent 178 gives you an extra benefit by providing corrosion protection at no extra cost. Rust prevention lengthens the life of distribution and storage facilities all the way from refinery to customer. Gulf Agent 178 can make your gasoline a better, more saleable product. Let us show you how. Write or phone Petrochemicals Department Sales Office, Gulf Oil Corp 360 Lexington Ave. New York 17, N.Y.

GULF

Quality Chemicals from Petroleum

Two Joy WB-14 compressors boosting residue gas from field processing. Cylinders 4¾ x 7; suction pressure 420 psig; discharge pressure 450 psig; capacity 13.5 mmcfd.

HEAVY DUTY IN A HANDY PACKAGE . . .
JOY PACKAGED GAS COMPRESSORS

for gas boosting—repressuring—gas lifting

Joy gas compressors are built on a single skid, ready for over the road hauling. They arrive at your site, assembled and completely self-contained, ready for hook-up.

The semi-radial design of the compressor makes it extremely compact, yet all parts are readily accessible. This compactness, light weight, and package assembly results in economy five ways: in purchase, in moving, in installation, in maintenance, and in operation.

If your requirements should change, it is easy to change volume or pressure because any Joy cylinder fits any Joy frame. For maximum capacity in a powerful package choose a Joy gas compressor. Units available from 50 to 400 hp. See these fabricator-distributors for Joy gas compressors.

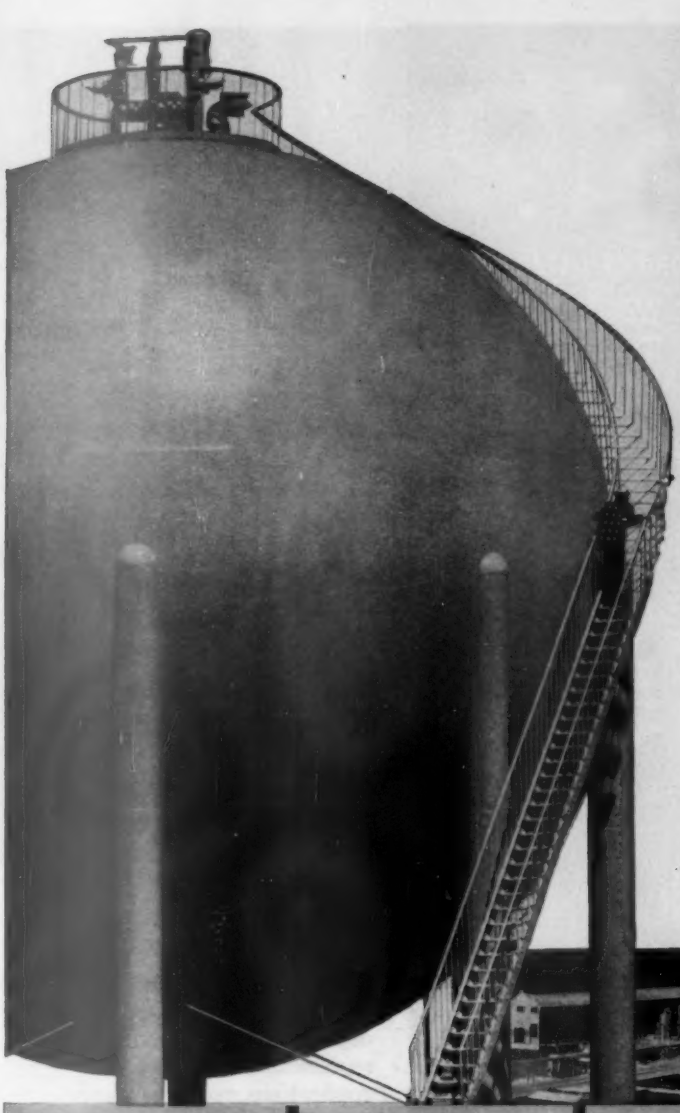
Houston 2, Texas: Oil & Gas Supply Company • 2525 San Jacinto Street
Houston 24, Texas: Southwest Industries, Inc. • P. O. Box 19392
Tulsa, Oklahoma: Cherokee Steel, Inc. • 160 N. Rockford
Pittsburgh 34, Pa.: P. C. McKenzie & Company • 3829 Willow Ave.

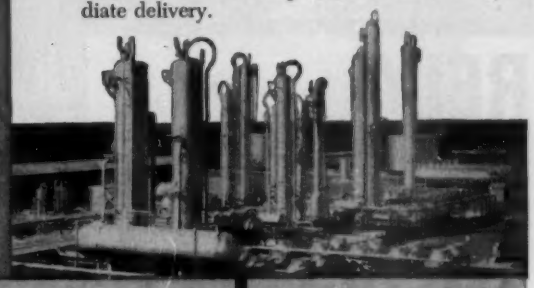
Tough, colorful, lasting beauty!

Take those pumps and rigs in the oil fields—or those tanks and pipelines in the refineries! Each needs the tough, colorful, lasting beauty that Rust-Oleum provides. If the surface is rusty, Rust-Oleum 769 Damp-Proof Red Primer can be applied *right over the sound rusted surface* after removing rust scale and loose rust. Special Rust-Oleum Oil Field Finishes match the original equipment colors on pumps and rigs—while other long-lasting Rust-Oleum coatings protect costly tanks and pipe lines.

They're specially made for oil field use—tough, flexible, easy-to-use on the spot by brush or spray! They dry to firm, glossy finishes that resist sun, fumes, heat, moisture, weathering, and blowing dust and sand.

Try Rust-Oleum . . . your Rust-Oleum Distributor maintains complete stocks for immediate delivery.





Apply Rust-Oleum 769 Damp-Proof Red Primer directly over sound rusted surfaces.

Follow-up with the Rust-Oleum finish coating in the color of your choice

By brush or spray — the Rust-Oleum system provides tough, colorful, lasting beauty.

Dries to a firm finish that resists sun, fumes, heat, weathering, and blowing dust and sand.

RUST-OLEUM®

There is only one Rust-Oleum. Distinctive as your own fingerprint.

STOPS RUST!®

Mail coupon today for FREE TEST SAMPLE

RUST-OLEUM CORPORATION
2626 Oakton Street, Evanston, Ill.
Dallas Branch: 3200 McKinney, Dallas, Tex.

☐ Free test sample of 769 Damp-Proof Red Primer to be applied directly over sound rusted surfaces.

☐ Complete literature with color charts.

ORIFICE METERS

American-Westcott Dri-flo and mercury manometers in recording, indicating and integrating models—to 5000 psi working pressure.

GASCLOK

Gas or air-operated instrument power drive and timing unit for remote installations.

CANNON PENS

Controlled-flow capillary meter pens record up to a full year without refilling—eliminate chart smearing and blurring.

CONTROLLERS

Series A-58 Controllers, Transmitters & Receivers for control of continuous process variables. Telemetering Systems designed to meet your requirements.

RELY ON AMERICAN® INSTRUMENTS FOR YOUR TOUGHEST JOBS

American's complete line of equipment sets the highest standards for accuracy and dependability. Ask your American representative about their applications and advantages for your measurement and control problems.

AMERICAN®
METER COMPANY
INCORPORATED ESTABLISHED 1836

AMERICAN METER CO EST 1836 MEASUREMENT ENGINEERS

GENERAL SALES OFFICE: Philadelphia 16, Penna. • Albany Atlanta • Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Houston • Kansas City • Los Angeles Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle • Tulsa • Wynnewood

IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario Calgary • Edmonton • Montreal • Regina • Vancouver

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

SULPHURIC ACID

to 1/10th of 1%

Tailor-made for YOUR Process

as delivered

Do you use 100.3%? Or 96.1%?

You name it and we deliver it ready for your processing line.

What's more... deliveries are prompt and dependable. Consolidated's big fleet of tank cars, trucks and barges is handled by an exceptionally skilled traffic department. Movements are traced day by day ...and we load and start shipments so they reach you on time.

And don't forget...if spent sulphuric acid is one of your problems, our regeneration facilities at Houston and Baytown, Texas; at Baton Rouge, La., and Hammond, Indiana, are the largest in the world. Virgin water-white H_2SO_4 from any processable acid we can pump out of barge, car or truck!

Sulphuric Acid is also shipped from Ft. Worth and Corpus Christi, Tex., LeMoyne, Ala., Los Angeles and Richmond, Calif., and Tacoma, Wash.

STAUFFER CHEMICAL COMPANY

380 Madison Avenue, New York 17, New York

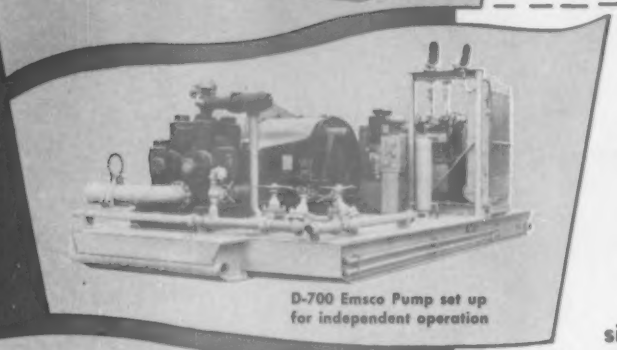
Prudential Plaza, Chicago 1, Illinois — 636 California Street, San Francisco 8, California

824 Wilshire Boulevard, Los Angeles 17, California — P. O. Box 9716, Houston 15, Texas

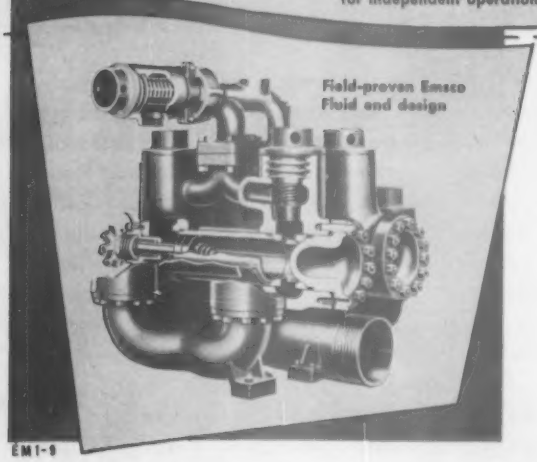
CONSOLIDATED CHEMICAL INDUSTRIES DIVISION, 6910 Fannin St., Houston 25, Texas

High performance . . . LOW weight . . . from

DA-850 Emsco Pump with Mid-Continent Swinging pump drive



D-700 Emsco Pump set up for independent operation



Field-proven Emsco Fluid end design

EM1-9

EMSCO

"D" SERIES PUMPS

Emsco's rugged herringbone gear train and weight reducing Fabriform construction offer more horsepower per pound than any other slush pump. The fastest possible penetration is assured while transportation costs and rig-up time are held to a minimum.

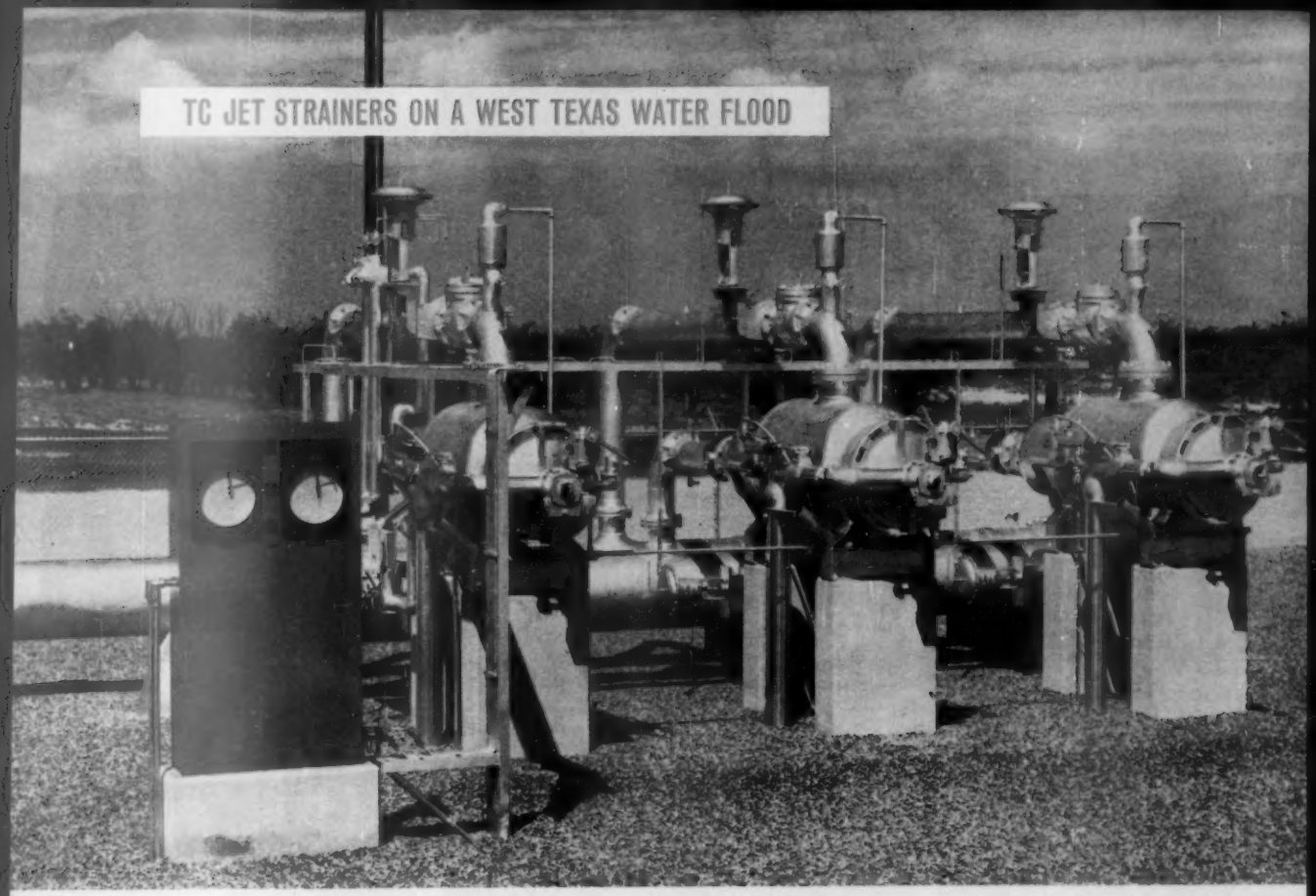
For increased efficiency and simplified maintenance, Emsco's steel fluid end design features solid cylinder heads with no liner lock bolts, exposed liner construction to lessen possibility of fluid end washouts, and threaded valve pot covers to permit easy access to valves. Let a Mid-Continent representative help select an Emsco Pump for your drilling requirements.

MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

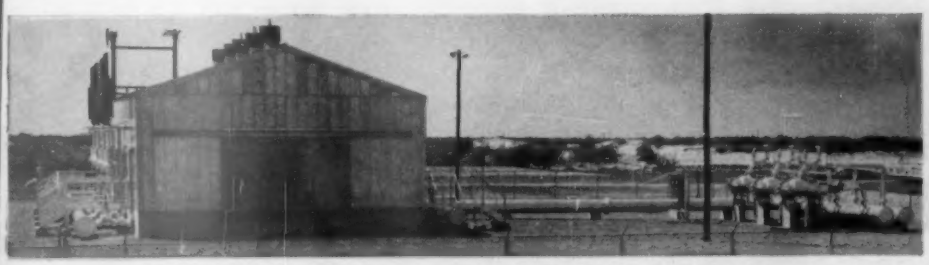


The One Sure Way to Clean Up Injection Flood Water

There's a big difference in water filtration equipment. Here, for example, are three small, compact, T-C Self-Cleaning Jet Strainers with a huge capacity for handling injection flood water. But best of all, these strainers require little attention, even less maintenance expense. In fact, their operation is fully automatic. They clean themselves when the baskets become dirty. At a predetermined pressure-differential across the basket, rotating jets go into action and scour the baskets clean. The entire cleaning operation takes only a few minutes.

T-C Jet Strainers are available in 10H, 20H and 30H sizes. 100, 200, and 400 mesh screens are interchangeable, depending on the particle size of sand and solids to be removed from the water. Extremely fine filtration, down to sub-micron particle size—including algae and bacteria—can be obtained easily with the aid of a diatomaceous earth coating on the basket.

If you attach importance to the cleanliness of your flood water—and most operators do—you should know all about T-C Jet Strainers. A brochure will gladly be sent on request.



An over-all view of a water filtration installation near Odessa, Texas. The three Model 30-H, T-C Self-Cleaning Jet Strainers are shown in the close-up above and at far right in this picture.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

NOW YOU CAN BUY BUTTRESS WITH THE ORANGE BANDS

Youngstown is in full production on buttress thread casing

SIZES 5½" through 9⅝" are being shipped in the standard grades J-55, N-80 and P-110—with higher grades available on inquiry.

Buttress thread permits a lighter weight or lower grade casing, depending on your string design. And since buttress and API 8-round coupling dimensions are identical, you can use this stronger casing without making a single change on your rigs.

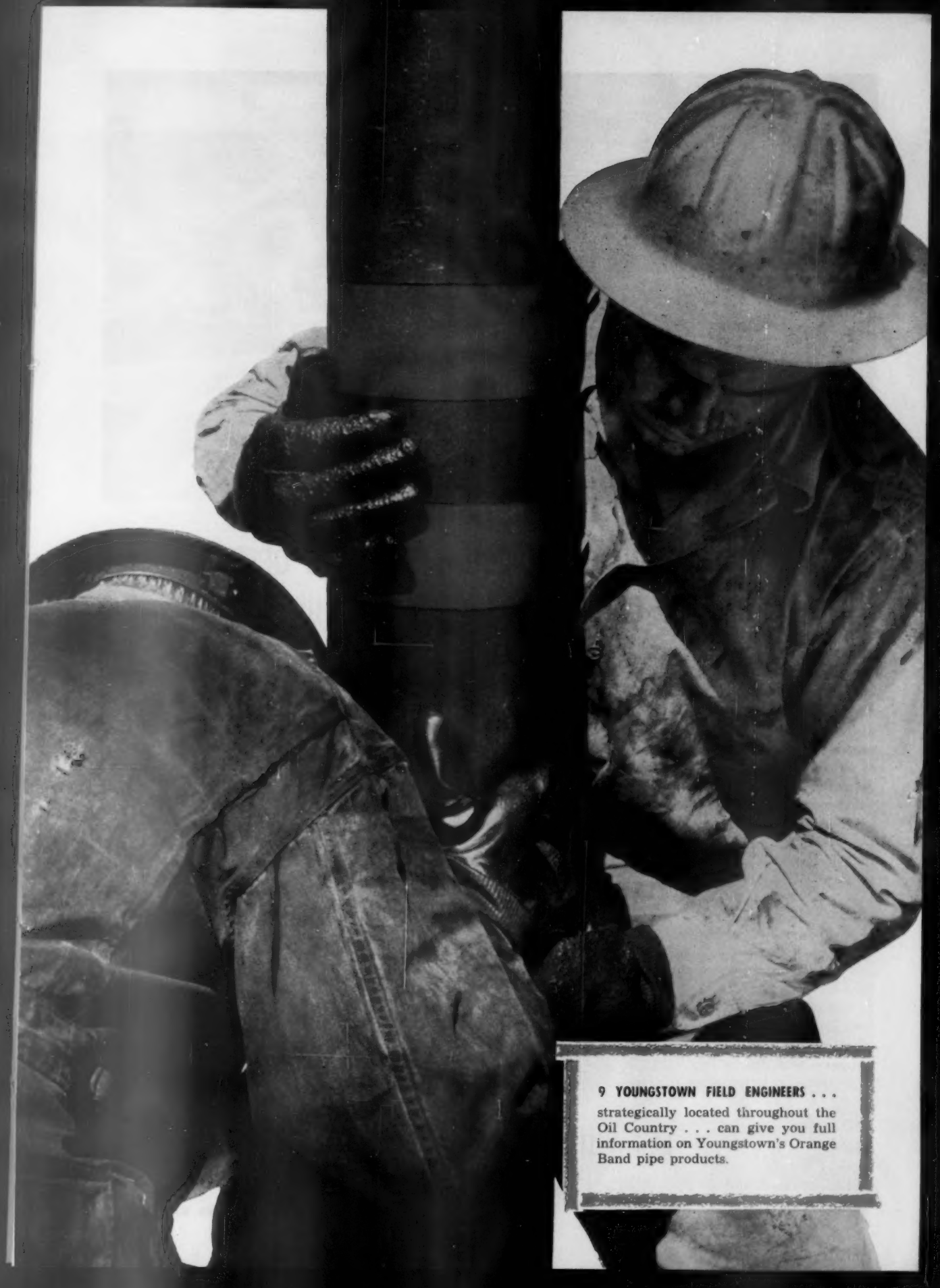
Now if you've passed up buttress strength because of higher initial cost, check the cost-strength ratio in this Orange Band casing. It costs slightly more—but *no other casing gives you so much strength at so low a cost.*

Your Youngstown man will give you complete data—or write direct to our Home Office for the new brochure, "Youngstown Buttress Thread Casing".

BUTTRESS THREAD CASING

QUALITY YOUNGSTOWN SERVICE

Youngstown
Youngstown, Ohio
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Carbon, Alloy and Yoloy Steel



9 YOUNGSTOWN FIELD ENGINEERS . . .
strategically located throughout the Oil Country . . . can give you full information on Youngstown's Orange Band pipe products.

BENDIX FUEL INJECTION EQUIPMENT AIDS OPERATION AT ONE OF CANADA'S LARGEST URANIUM MINES!

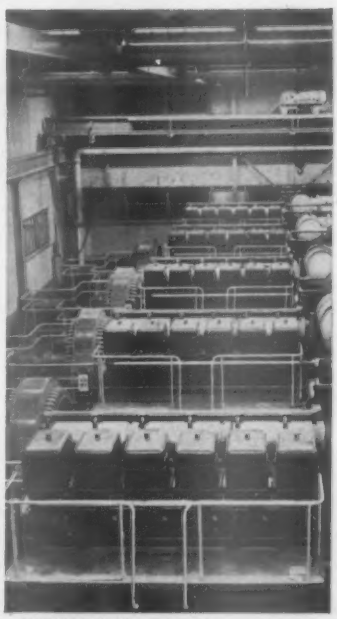
The Gunnar Mines, Limited, uranium ore mining operation in Northwestern Saskatchewan is one of the largest producers of uranium in Canada. And to process the uranium ore at Gunnar, diesel power is supplied by Nordberg Supairthermal Diesel engines equipped with Bendix* Fuel Injection Equipment.

Operating only 450 miles south of the Arctic Circle, the diesel equipment must operate efficiently in temperatures that reach –55°F. Since the area does not lend itself to hydroelectric generation of power, Gunnar chose a diesel-electric type power plant. The Nordberg Diesels, each rated 1200 hp at 450 rpm, are directly connected to the generators.

This strategically valuable uranium deposit utilizes its diesel-electric power plant to the fullest. Diesel engines equipped with Bendix Fuel Injection Equipment aid in furnishing the electric power for the mine, mill, and town facilities.

Only the best of diesel equipment and diesel engine components such as Bendix Fuel Injection Equipment were selected for this vital work. For, only the best will do when the demands are great on diesel engines—for all types of industry. And Bendix Fuel Injection Equipment meets the highest standards for exceptional performance. *REG. U.S. PAT. OFF.

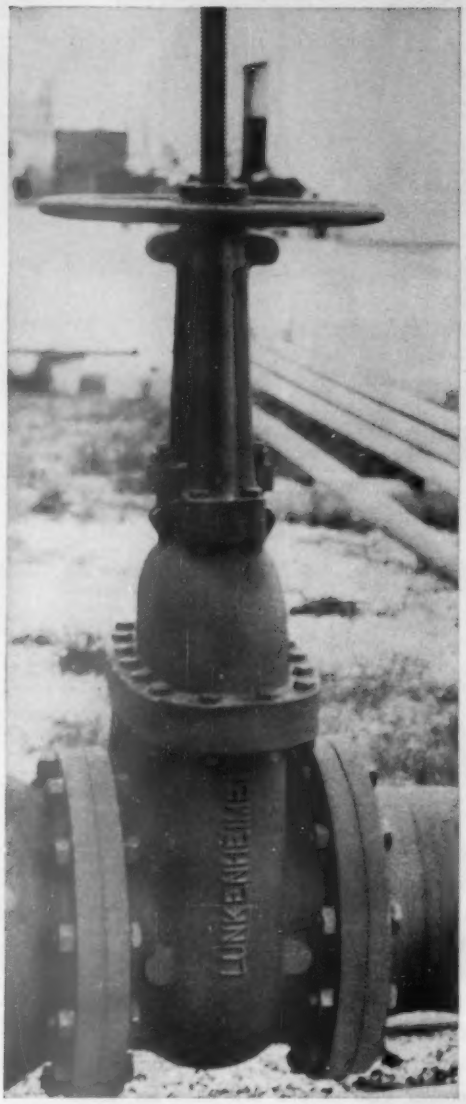
SCINTILLA DIVISION OF
BENDIX AVIATION CORPORATION, SIDNEY, N. Y.
Export Sales and Service: Bendix International Division,
205 East 42nd St., New York 17, N. Y.



1200 HP Nordberg Diesel generator sets supply 5070 kw.

Scintilla Division
SIDNEY, N. Y.

Bendix
AVIATION CORPORATION



TO KEEP MAINTENANCE COSTS DOWN . . .

New GREX Plant "Goes On Stream" with Lunkenheimer Valves

When W. R. Grace & Co.'s new multi-million dollar GREX plant at Baton Rouge, La.*, went into operation, another 50 million pounds were added to domestic high-density process polyethylene capacity.

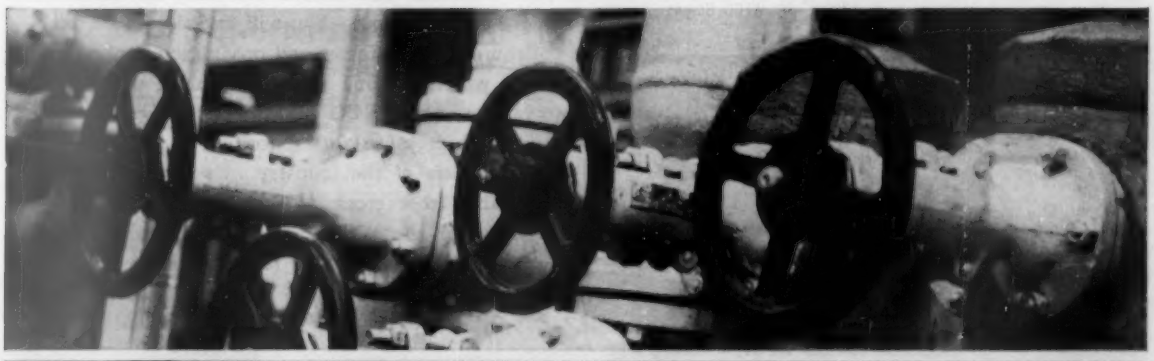
Lunkenheimer Valves were placed in various production units throughout the plant. Thanks to sound planning, valve maintenance expense will be kept to a minimum . . . because, part-for-part, Lunkenheimer Valves provide longer maintenance-free performance than any other valves.

In manufacturing, institutional and commercial buildings all over the world—Lunkenheimer Valves have established unmatched performance records for almost a century. When you can specify Lunkenheimer at no extra cost, why settle for anything less than the best?

We would appreciate the opportunity to make specific recommendations for maintenance-saving Lunkenheimer Valves in your new project or on your manufactured equipment. Write The Lunkenheimer Co., Cincinnati 14, Ohio.

*Engineered and built by: The Fluor Corporation, Ltd., Los Angeles, Calif.

Lunkenheimer All-Iron Gate Valves are used extensively throughout the new GREX plant. *Machined Guides*, another Lunkenheimer exclusive, eliminate chatter and reduce wear! *True-solid Discs* are unaffected by temperature variations!

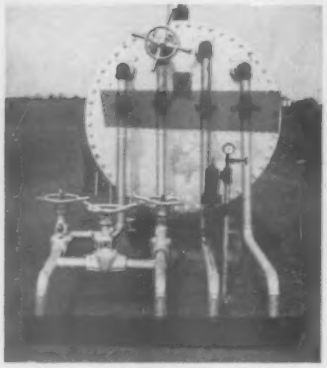


LUNKENHEIMER QUALITY

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

WECO Unions on gas cooling coils for repressuring unit



Heater Hook-up with WECO Unions

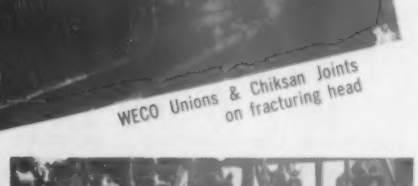
WECO Unions & Chiksan Joints on fracturing head

WECO UNIONS
ARE EVERYWHERE IN THE OIL INDUSTRY

On the drilling rig you find them on mud suction and discharge lines . . . on fuel, steam and water lines . . . on stand pipe connections . . . blowout preventer hook-ups. You will find them, too, on service company trucks, lines and head connections in cementing, acidizing and fracturing operations.

Wherever there is production, WECO Unions are used in making up headers and manifolds; tank, heater, treater and separator installations; on flow lines, meter connections and wherever else unions are used for faster, more efficient piping. You will find them also on offshore rigs, platforms and production hook-ups —on water flooding and repressuring projects.

There is a WECO UNION of the right type, size and pressure rating for every service in every phase of the industry . . . and they are available from stock at Supply Stores everywhere. For the WECO Unions you need—see your WECO catalog, or refer to pages 5105-5124 of your Composite Catalog; call your Supply Store or your WECO representative.



Blowout preventer control lines with WECO Unions and Chiksan Joints

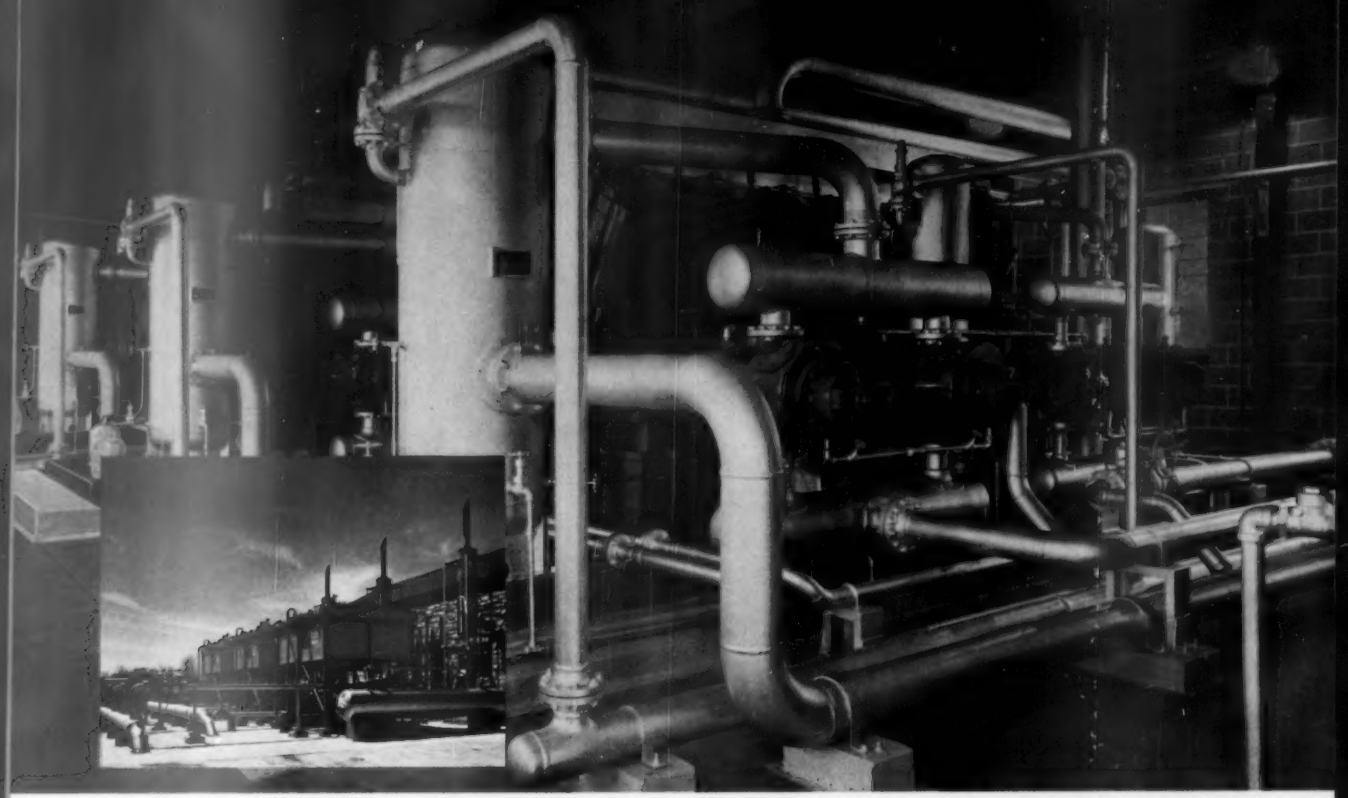
Production manifolds are easily made-up with WECO Unions

WECO WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY a subsidiary of FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

U-5-59

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Horizontal radiators are cooled by hydraulic motor driven fans powered by pumps V-belted to sheaves on the end of each engine crankshaft.

Laclede Gas Company's Gas Storage Project—equipped with three Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors. Units have Young radiators with gas, lubricating oil and engine water cooling sections. Other Beaird compressors from 120 to 660 h.p.

PACKAGED COMPRESSORS STORE WINTER'S RESERVE GAS SUPPLY FOR ST. LOUIS

IN ONE of the largest and most successful projects of its type, Laclede Gas Company of St. Louis is pumping billions of cubic feet of natural gas into sandstone that never held gas before. This additional supply will meet peak load demands enabling the company to heat additional thousands of St. Louis homes this winter.

Three Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors are taking up to 16 MMcfd, delivered by pipeline from Louisiana, compressing it through two stages from 50 to 125 psi. suction to 655 psi. discharge. The gas is injected down 1400-1500 foot wells into a natural sandstone reservoir bed.

Gas interstage and after cooling is provided in sections of the horizontal radiators mounted outside the compressor building. Use of electric motors to drive auxiliary equipment has been eliminated wherever possible. Pumps for engine cooling water, lubricating oil and radiator hydraulic fan motors are all driven off the compressor.

LOWEST COST PER HORSEPOWER INSTALLED

BEAIRD
another AMF product
PACKAGED COMPRESSOR PLANTS

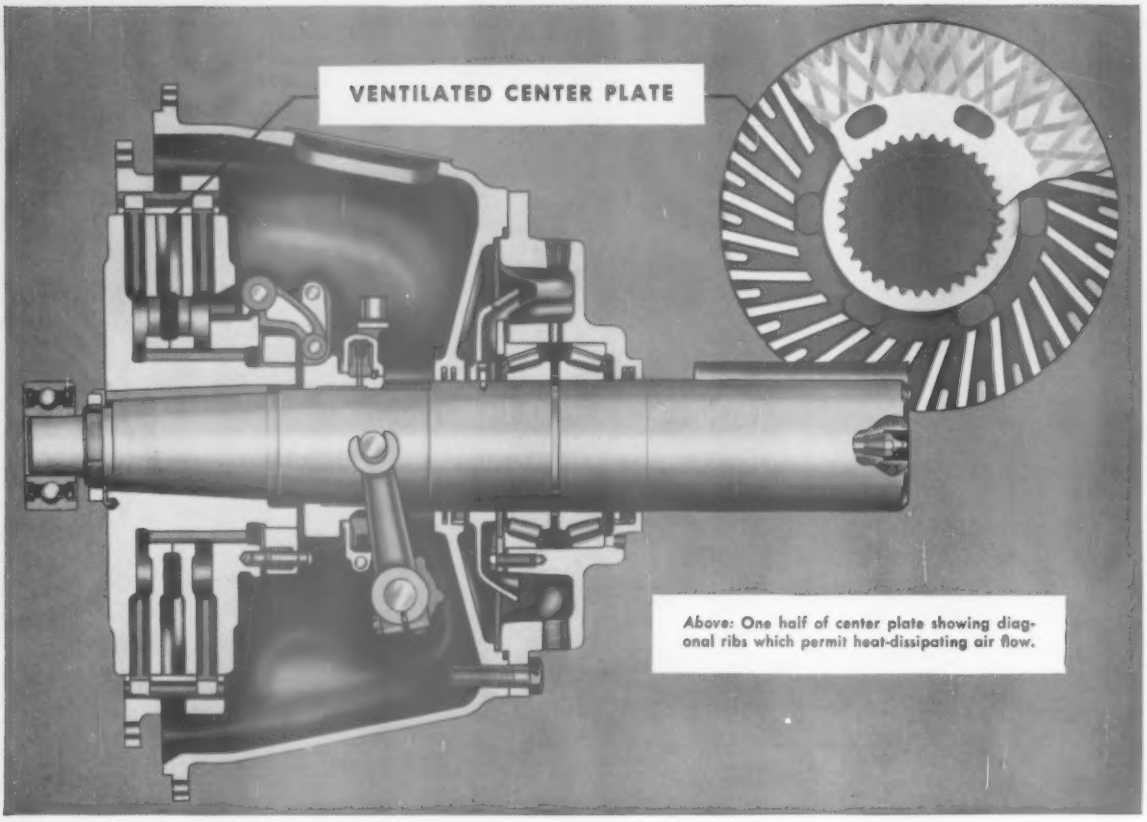
Packaged Compressors are just one of the many products manufactured by Beaird for the petroleum and petrochemical industries. When you are in the market for new equipment or assistance in developing a specialized product . . . contact Beaird for a qualified appraisal or quotation.

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

A Subsidiary of American Machine & Foundry Company

SHREVEPORT, LOUISIANA • *Sales Offices: Dallas, Houston, Corpus Christi and Midland, Texas • New Orleans, Louisiana • Tulsa, Oklahoma • Denver, Colorado Los Angeles, California, and Cie. Ingersoll-Rand, Paris, France.*

BEAIRD INTERNATIONAL, INC.
SHREVEPORT, LOUISIANA • *Sales Offices: Calgary, Alberta, Canada • Caracas, Venezuela.*



Above: One half of center plate showing diagonal ribs which permit heat-dissipating air flow.

High-energy, high-speed power take-off

features ventilated center plate and oil-lubricated tapered roller bearing

Here is a new PTO—Twin Disc Model IBF-214P—designed for high-speed engines not yet off the drawing board . . . *engines developing 300 to 500 hp at speeds up to 3380 rpm!*

These high speeds are possible because of improved design including the elimination of heavy counterweights, thereby improving overall balance and reducing link and pin stresses.

In addition to its high speed rating, this new unit offers two other important advantages over standard PTO's:

1) The ability to withstand high-energy loads through use of a unique center plate design.

High-energy heat loads create uneven thermal stresses which in turn cause clutch failure by starting cracks in the center plate. This problem is usually traceable to heavy starting loads such as occur in rock crushers, heavily-loaded conveyors and similar equipment.

The center plate on the Model IBF-214P Power Take-Off is ventilated by means of a two-piece design with diagonal ribs cast into each plate. Placed back to back, the ribs cross each other to form only small diamond-shaped contact areas, thus allowing air flow to dissipate excess heat.

2) The ability to operate for six months between lubrication periods thanks to improved throw-out collar design and oil lubrication of the tapered roller bearing.

Oil rather than grease is used for bearing lubrication so as to assure safe operating temperatures at the high speeds for which this unit is designed. The top of the bearing carrier has a small cast cavity which is kept full of oil by a slinger dipping into the sump. A drilled hole from this cavity feeds the bearing to assure constant oil circulation.

A special clutch engagement mechanism cuts throw-out collar wear. Lubrication is needed only twice a year in normal service.

Complete details and specifications on Model IBF-214P are available from our Racine office. Request Bulletin No. 308-B, Supplement A.

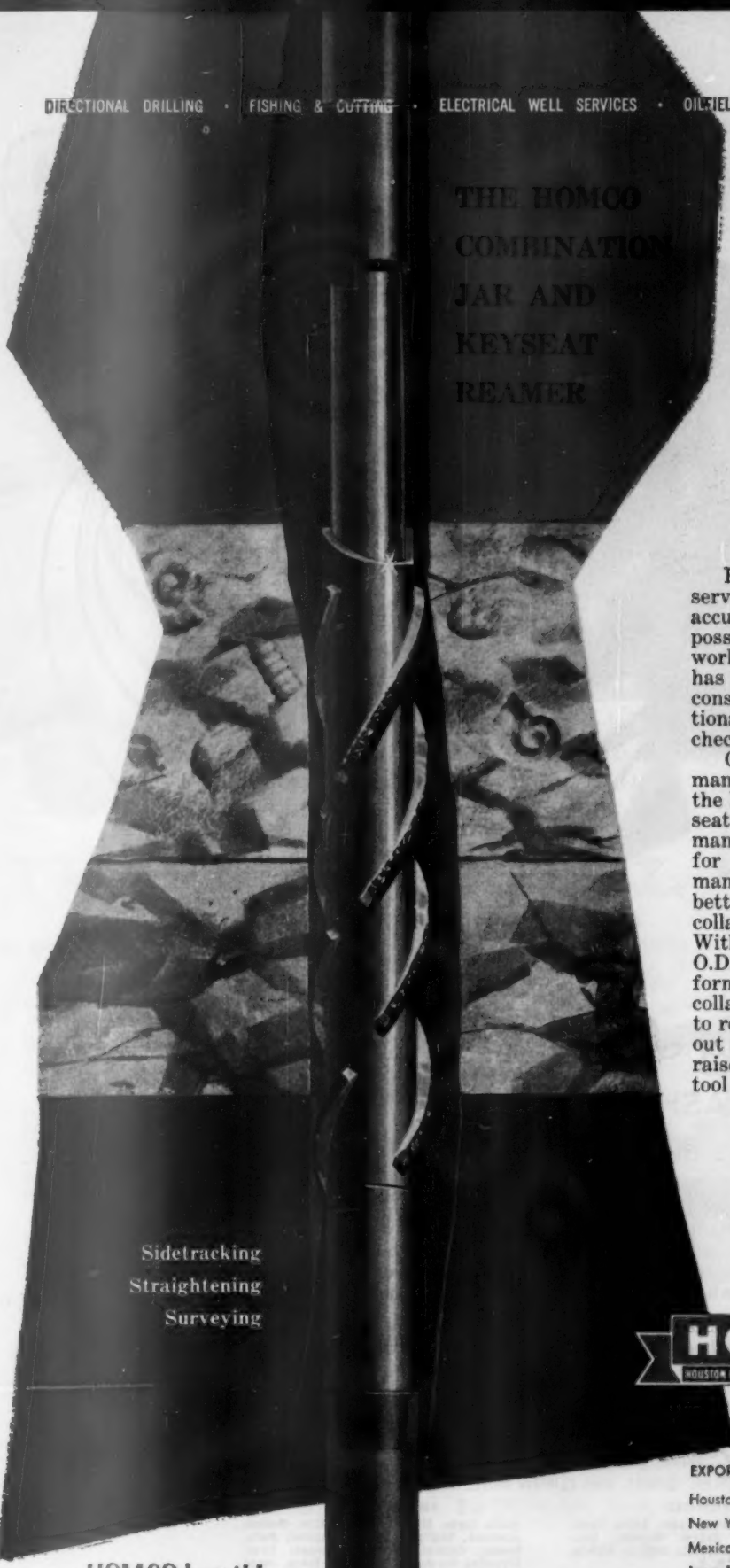
TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois

DIRECTIONAL DRILLING · FISHING & CUTTING · ELECTRICAL WELL SERVICES · OILFIELD SUPPLIES · EXPORT TOOLS & SERVICE

HOMCO
Houston Oil Field Material Company, Inc.
Directional Drilling



Stops the trouble before it starts

Homco Directional Drilling is a service designed to give you the most accurate and most economical job possible. The skilled Homco operator working for you knows his job and has the tools to do it right. He is in constant contact with a staff of Directional Drilling experts who guide and check his operations.

One of the tools that the Homco man uses in directional drilling is the Homco Combination Jar and Keyseat Reamer. This tool, designed and manufactured by Homco, primarily for Directional Drilling, prevents many a stuck string. There is no better insurance against stuck drill collars in keyseats than this tool. With reamer blades larger than the O.D. of the collars, when keyseats are formed the tool sticks instead of the collars. When this occurs it is easy to rotate to the right to jar down and out of the keyseat. Then the string is raised, rotated to the right, and the tool reams up through the keyseat.

research
engineering
developing
manufacturing

Sidetracking
Straightening
Surveying

HOMCO
HOUSTON OIL FIELD MATERIAL COMPANY, Inc.
THE WORLD'S LARGEST INDEPENDENT DIVERSIFIED SUPPLY AND SERVICE ORGANIZATION

HOMCO has it!

EXPORT OFFICES
Houston, Texas (Headquarters)
New York, N.Y.
Mexico City, Mexico
Long Beach, California
Maracaibo, Venezuela
Paris, France

WRITE FOR TECHNICAL INFORMATION AND BROCHURES

When you hang Liners

USE BAASH-ROSS LINER HANGERS...

Types are available for every well condition!

Baash-Ross Liner Hangers — including plain type, regular action packing type, delayed action packing type, and Liner Hangers with hold-down slips, as well as setting tools and cementing manifolds — meet every requirement for safety in positive setting and, when necessary, effective cementing jobs.

Write for the new Baash-Ross technical manual on Liner Hangers which gives full information on all Baash-Ross Liner Hanger equipment and liner hanging techniques.

BAASH-ROSS DIVISION
OF JOY MANUFACTURING COMPANY

GENERAL OFFICES: 5306 CLINTON DRIVE, HOUSTON, TEXAS

AREA OFFICES:
Houston, Texas, Odessa, Texas, Dallas Texas; Long Beach, Cal.; Casper, Wyoming; Oklahoma City, Okla.; Olney, Ill.; Calgary, Alberta, Canada; New York, N. Y.

FOREIGN OFFICES:
Monte Carlo, Monaco; Mexico City, Mexico; Greenock, Scotland; London, England; Paris, France; Caracas, Venezuela; Buenos Aires, Argentina; Rio de Janeiro, Brazil; Tokyo, Japan

BAASH ROSS JOY

Set the Pace!

If you don't own one—better take a *good* look at The Cardwell Nomad! ***This is your competition!*** THIS is the unit that contractors will use to set the competitive pace in the 3,000-6,000 foot servicing and workover range . . . the unit designed to make a profit *even in the toughest situations!* Of course, if you ARE the contractor who sets the pace—one look will tell you: *The Cardwell Nomad is one of the most ruggedly efficient self-propelled servicing and workover units you can buy today!*

THE CARDWELL 'NOMAD'

NO OTHER UNIT OFFERS ALL THESE:

- **CARDWELL'S BIG TIME-PROVED HOIST!**
- **HIGH-PERFORMANCE INDUSTRIAL ENGINE!**
- **FULLY-ENCLOSED POWER TAKE-OFF CHAIN DRIVE!**
- **EASILY-ACCESSIBLE, FULLY-EQUALIZED BRAKES!**
- **CARDWELL'S SUPERIOR "FLEX-DISC" AIR CLUTCHES ON BOTH DRUMS!**
- **OPTIONAL HOIST CONTROL POSITIONS!**

SEND FOR THIS — TODAY!
Just out: A new 8-page brochure with complete specifications, approved engines, applicable Cardwell masts. Write for your copy and get the ***competitive*** facts!

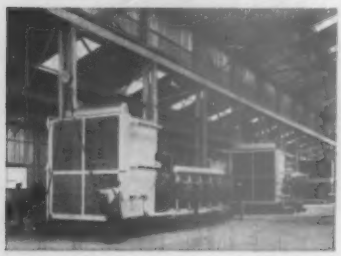
"For Tomorrow's Equipment—see Cardwell Today"

cardwell MANUFACTURING COMPANY

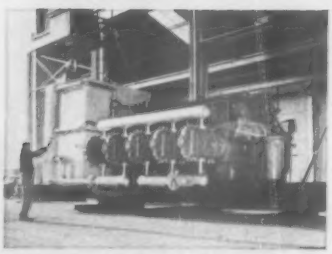
Box 2001, Wichita, Kansas • Cable: ALLSTEEL • Phone AMherst 7-3311

A single objective

CB/S CONTROLS are custom designed for *your* installation. Cooper-Bessemer En-Tronic remote control above can take over entire operation.



CB/S COOLERS are custom designed to match engine-compressors to specific field conditions.



DYNAMICALLY BALANCED Cooper-Bessemer engine-compressors reduce vibration to a minimum. Low RPM for maximum service life; 265 to 1100 BHP.

SPECIAL WELDING. CB/S uses back-up rings in *every* welded connection, not just at critical points. Welds are clean inside as well as out.

CB/S SCRUBBER is custom-built for greater freedom from shutdown due to liquid surges. Scrubber auxiliary equipment is finest available.

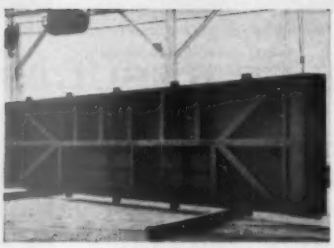
makes the difference . . .

CB/S PACKAGED COMPRESSORS

CB/S brings a new concept of specialization to the manufacture of packaged gas compressors. At CB/S all research, design and manufacturing have the *sole* objective of creating packaged units that will set new standards of dependable, economical, performance throughout the world. This dedication of purpose is found in every detail — from specially welded connections to the extra-rugged skid.

And, as a subsidiary of The Cooper-Bessemer Corporation, CB/S is uniquely able to coordinate design requirements of Cooper-Bessemer engine-compressors with your specific field requirements. This results in *optimum performance* and *undivided responsibility* for the entire package.

Before ordering your next packaged compressor, look into the specialized design and single responsibility of CB/S. Building better packaged compressors is our *only* business.



STRONG A-FRAME SKID is custom-designed for the engine-compressor; completely covered with checkered floor plate; no piping in skid.

TELETYPE CONNECTED warehouses in all major producing areas insure fast service and parts.

CB/S SOUTHERN INC., P. O. BOX 19267, HOUSTON 24, TEXAS

Photographed at Gulf Refinery, Philadelphia, Pa.

THE GOLDEN RULE THAT PRODUCES RESULTS...

Our golden rule is teamwork between refiners and Cyanamid. As a result of this teamwork, Cyanamid produced the first fully regenerative platinum reforming catalyst and helped develop the first micro-spheroidal synthetic fluid cracking catalyst. Continued co-operation between refiners and Cyanamid is sure to produce further advances in catalytic refining techniques.

Symbolizing this co-operation is Cyanamid's salesman–the man with the golden rule. You can depend on him at all times for help in meeting the operating problems caused by demands for ever-improved fuels. His personal knowledge is backed by the research and production facilities of one of the world's leading producers of catalysts. Call him anytime he can be of help to you . . .

Basic in catalyst chemistry CYANAMID

AMERICAN CYANAMID COMPANY • REFINERY CHEMICALS DEPARTMENT • 30 Rockefeller Plaza, N.Y. 20, N.Y.

the OIL AND GAS JOURNAL

TULSA OFFICE
211 South Cheyenne Avenue
Box 1260
Phone LUther 4-4411

George H. Weber ... Editor
Henry D. Ralph ... Chief Editorial Writer
Ted A. Armstrong ... News Editor
Gerald L. Farrar ... Engineering Editor
Frank J. Gardner ... Exploration Editor
Paul Reed ... Pipeline Editor
W. L. Nelson ... Technical Editor
Lynn M. Nichols ... Presentation Editor
John C. Casper ... Economics Editor
W. B. Bleakley ... Production Editor
Neil Williams ... Associate Editor
Peter B. Bike ... Geophysical Editor
Carl J. Lawrence ... Asst. News Editor
Gene T. Kinney ... Asst. Pipeline Editor
R. B. Tuttle ... Equipment Editor
C. Dudley Johnston ... Art Director

Robert B. Bizal ... Editorial Research
Carl Hoot ... District Editor
John C. McCaslin ... District Editor
W. A. Bachman ... District Editor
Deacon New ... District Editor
Merle F. Blakely ... District Editor
Sara Duncan ... District Editor
John H. Hyden ... District Editor
Max L. Batchelder ... Asst. Pres. Editor
Helen Brown ... Editorial Assistant
Alice Burt ... Editorial Assistant
Aileen Cantrell ... Editorial Assistant
Susan Boeckman ... Editorial Assistant
Margaret Higgs ... Editorial Assistant
Jo Anne Speaker ... Staff Artist
E. P. Stadler ... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

Paul Swain ... International Editor
Larry Resen ... Refining Editor
Ray G. Gibson ... District Editor
John P. O'Donnell ... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-3074

Robert J. Enright ... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

D. H. Stormont ... West Coast Editor
William T. Smith ... District Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ... Drilling Editor
Howard M. Wilson ... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Clyde La Motte ... Washington Editor

BUSINESS STAFF

P. C. Lavinger ... President

S. H. Rourke ... Executive Vice President
Mitchell Tucker ... Vice Pres. and Adv. Mgr.
Kenneth B. Barnes V.P., E. Hemis. Oper.

Hanson B. Pigman ... Circulation Manager
Donald W. Wilson ... Mgr. Industry Census
J. Parker Holland ... Production Manager

ADVERTISING STAFF

TULSA OFFICE
211 South Cheyenne Avenue
Phone LUther 4-4411

John D. Reilly ... Mid-Continent Manager
Roy E. Finley ... Representative
D. B. Miller ... Classified Adv. Mgr.

PHILADELPHIA OFFICE
1059 Land Title Building
Broad and Chestnut Streets
LOcust 3-0118

John W. Meany, Jr. ... District Manager

PITTSBURGH OFFICE
Law & Finance Building, 429 Fourth Ave.
Room 1505, GRant 1-5847

Ernest S. Holzworth ... District Manager

DETROIT OFFICE
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455

John D. Yoder ... District Manager

LOS ANGELES OFFICE
650 South Grand Avenue, MAdison 2-0722

George O. Ruppert ... District Manager

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

E. S. Klappenbach ... Eastern Manager
Harry B. Bullen ... Representative

CHICAGO OFFICE
105 West Madison Street
Phone CEntral 6-2537

David T. Kenney ... District Manager
Karel Wegkamp ... District Manager

HOUSTON OFFICE
802 American Investors Building
CApitol 4-7726

John M. Spears ... Gulf Coast Manager

DALLAS OFFICE
1238 Mercantile Building
Riverside 8-3074

Pren G. Hollingsworth ... Representative

ENGLAND
National Provincial Bank Chambers
15 Grafton Street, Altrincham
Phone Altrincham 3160

Harry Becker ... European Representative

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00.

Member
Audit Bureau of Circulations
Associated Business Papers

They Say—

Effective octanes

Dear Sir:

In your August 24 issue you carried an article, "Rockies Tops in Effective Octanes," with two supplementing maps which were very interesting to us.

In fact, we are sufficiently interested to the point that we would like the privilege of thermofaxing the two maps so that we could distribute them to our district field personnel.

Our experience with consumers has revealed that they do not take into consideration the effects of altitude on the effective octanes of both premium and regular gasoline. As a result of this and the general circumstances that surround pinging or knocking in an engine, it leads to condemnation of the quality of the product. We believe the facts as provided on your maps will enable our field personnel to assist in clarifying problems of this type when they arise.

We want to compliment you on the preparation of this particular subject . . .

H. F. Wagner, Manager
Petroleum Marketing and Technical Service
Farmers Union Central Exchange, Inc.
St. Paul, Minn.

Twasn't that good!

Dear Sir:

I suppose by now several thousand people have advised you that our third producer in the Swanson River Unit of Alaska tested at 100 b/d, not 3,100 b/d. Much as we would like to have a 3,100 b/d well, it just ain't so.

G. M. Carruthers
News Bureau Editor
Standard Oil Co. of California
San Francisco.

Editor's note: We didn't hear from "several thousand," but we did get a call from a fellow in Michigan asking if he should buy more stock. Western Union threw in that extra "3" somewhere between Los Angeles and Tulsa.

Science needs rebels

"The participant in scientific activity must endeavor to change the status quo. Every new bit of data, every

FOR WATER FLOODING
you're money ahead with
F-M PUMPING . . .

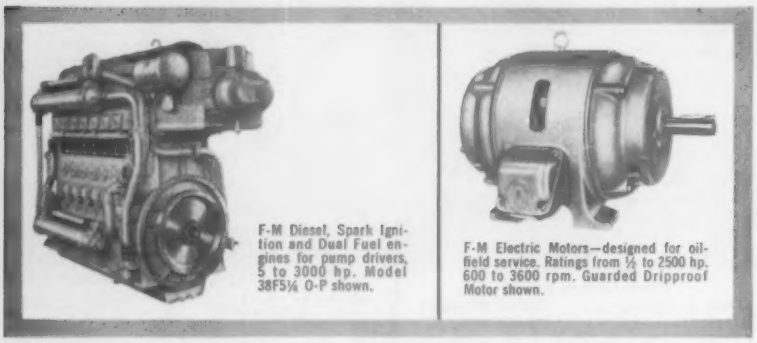
F-M Inverted Pot-Type Turbine Injection Pumps—for lowest cost water flooding at pressures to 3000 psi., capacities to 50,000 bbl. per day.

F-M Turbine-Type Well Pumps—capacities to 30,000 gpm., pressures to 1500 ft. Sizes 4" through 48". Water or oil lubricated.

F-M Double-Suction Single-Stage Centrifugal Pumps—for economical back washing and filtering operations at capacities and heads required.

F-M Westco Peripheral Pumps—for general purpose applications on low, medium or high head service. Capacities 10 to 200 gpm., pressures to 900 ft., sizes 1¼" through 2½".

matched by **F-M POWER!**



F-M Diesel, Spark Ignition and Dual Fuel engines for pump drivers, 5 to 3000 hp. Model 38F5¼ O-P shown.

F-M Electric Motors—designed for oilfield service. Ratings from ½ to 2500 hp. 600 to 3600 rpm. Guarded Drippproof Motor shown.

You cut costs and eliminate problems all the way when you specify Fairbanks-Morse for *both* power and pumping!

1 *One* source of supply speeds deliveries of every unit—lets you maintain schedules and meet emergencies!

2 *One* source of responsibility assures fast, positive service and repairs—keeps you in operation!

3 *One* source of engineering and manufacturing means matched performance of pump and driver—expert field-proven set-ups you can depend on for dependable output and economy!

Get the facts on the broad F-M Oilfield line—write Fairbanks, Morse & Co., Oilfield Division, 1713 N. Market St., Dallas 2, Texas.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

DIESEL, DUAL FUEL AND GAS ENGINES • LOCOMOTIVES • ELECTRIC MOTORS • PUMPS • COMPRESSORS • GENERATORS • SCALES • MAGNETOS • HOME WATER SYSTEMS

new theory or insight, invalidates to some extent what was known or understood before.

"Authority is transient, laws are mutable, facts are temporary.

"I hope our educational processes can be flexible enough to tolerate the inquisitive, skeptical, often rebellious student. We do not know whether such ability can be developed but we do know that it can be aborted or stifled.

"It is not easy to get along with the innovator. As a spokesman for industry, I can assure you that we want and we need the individualist, the nonconformist, the rebel with a cause. As a citizen, I hope our social pressures and educational methods will continue to pick out such individuals and make it possible for them to preserve by innovation our freedom and our way of life."

Dr. Harold Gershinowitz, president of Shell Development Co., in a speech before teachers completing the Shell Merit Fellowship seminar at Stanford University.

Depletion allowance sound

"Percentage depletion is not preferential treatment for the extractive mineral industries.

"It simply recognizes the peculiar nature and characteristics of the petroleum industry and provides a means of equalizing its tax treatment with that of other industries.

"Finding oil is most uncertain and there is only one way this business can be carried on . . . by wildcatters, explorers, getting out in advance and exploring new territory, taking chances, running risks in the hope of bringing in a new well and new oil fields.

"Reduction in the current 27½% depletion rate would, in effect, be an increase in taxes on the petroleum industry which, in the long run, would have to be borne by the consumer.

"The search for and development of oil reserves must have differential tax treatment just to be put on a par with other industry."

Rep. John Jarman of Oklahoma in a speech on floor of the House of Representatives.

How gas affects oil's price

"Natural gas is the factor most likely to influence oil prices in the future.

"A high proportion of the discovery costs of oil and gas reserves are joint and cannot be allocated except by some arbitrary means. Because the bulk of the gas moving into the marketplace competes with fuel oils, the

1.

THIS OTIS TOOL SAVED US

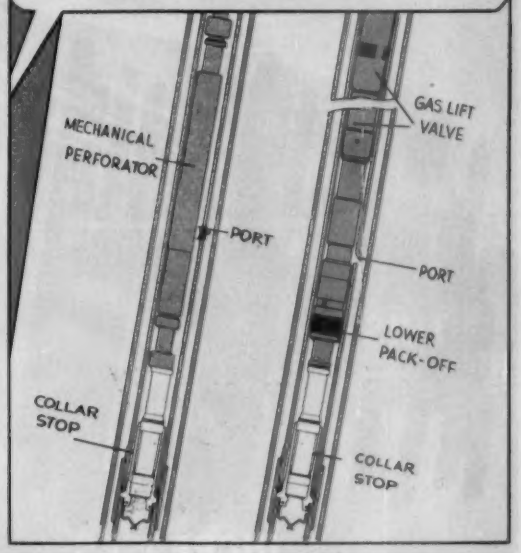
$350,000.00

IN WORKOVER COSTS LAST YEAR.

IT'S THEIR TYPE C GAS LIFT VALVE RUN WITH A TYPE G REMOVABLE TUBING PACK-OFF ANCHOR. WITH IT OTIS CONVERTED A NUMBER OF OUR OLD WELLS TO GAS LIFT WITHOUT PULLING THE TUBING — AND THEY WERE WELLS THAT WERE ORIGINALLY COMPLETED WITH NO PROVISIONS MADE FOR GAS LIFT.

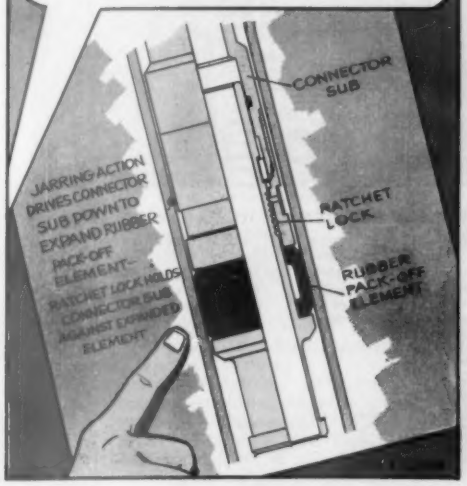
2.

THE TECHNIQUE OTIS USES IS SIMPLE AND FAST. FIRST, THEIR GAS LIFT SPECIALISTS DETERMINE THE NUMBER AND SPACING OF THE VALVES REQUIRED. THEN THEY CUT A PORT IN THE TUBING WITH A WIRE LINE MECHANICAL PERFORATOR AND PACK-OFF THEIR GAS LIFT VALVE OPPOSITE THE PERFORATION. A FULL OPENING TUBING STOP LOCKS THE TOOL IN THE TUBING. TO GIVE YOU SOME IDEA OF THE CAPACITY OF THIS TYPE OF INSTALLATION, **WE'RE MAKING 1,200 BARRELS OF FLUID PER DAY THROUGH 2" TUBING FROM ONE OF THESE WELLS.**

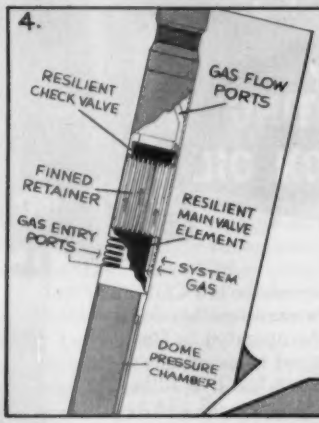


3.

AND THIS OTIS PACK-OFF GAS LIFT INSTALLATION IS ONE OF THE MOST FOOLPROOF WE'VE EVER HAD. FOR EXAMPLE, EACH CHECK VALVE AND PACK-OFF CAN BE TESTED AS IT'S RUN BY PRESSURING UP ON THE TUBING. ALSO, WE KNOW EACH VALVE STRADDLES THE PORT IN THE TUBING BECAUSE THE LOWER PACK-OFF ANCHOR IS LANDED ON THE SAME OTIS COLLAR STOP USED TO LOCATE THE PERFORATOR. AND BECAUSE THE PACK-OFF ELEMENTS ARE SET AGAINST THE TUBING WALL MECHANICALLY, WE KNOW THEY'LL STAY EXPANDED. HERE'S HOW THE PACK-OFF ELEMENTS WORK.


CONNECTOR SUB
JARRING ACTION DRIVES CONNECTOR SUB DOWN TO EXPAND RUBBER PACK-OFF ELEMENT—
RATCHET LOCK HOLDS CONNECTOR SUB AGAINST EXPANDED ELEMENT
RATCHET LOCK
RUBBER PACK-OFF ELEMENT

4.



AS FOR OTIS' GAS LIFT VALVES — THIS DIAGRAM WILL HELP EXPLAIN WHY **THEY REALLY LIFT THE FLUID.** THEY HAVE NO SPREAD — CONSEQUENTLY YOU GET MAXIMUM EFFICIENCY FROM YOUR SYSTEM GAS. THE VALVES HAVE NO MOVING METAL PARTS, NO BELLOWS TO FATIGUE, NO SEATS TO CUT OUT—AND THEY HAVE EXTRA LARGE FLOW PORTS TO PASS A MAXIMUM AMOUNT OF GAS AT A MINIMUM PRESSURE. WITH OTIS VALVES IN YOUR WELL YOU CAN PRODUCE BY EITHER CONTINUOUS OR INTERMITTENT LIFT — WITHOUT THE EXPENSE OF CHANGING VALVES.

OTIS TELLS US THEY RUN A LOT OF THESE PACK-OFF GAS LIFT VALVES TO STRADDLE OLD STYLE "PIGGY BACK" VALVES AND ECCENTRIC SIDE POCKET MANDRELS WHEN THEY BECOME DEFECTIVE. THEY ALSO INSTALL THEM IN DUAL- AND TRIPLE-COMPLETIONS. **BEFORE YOU PULL TUBING** TO PUT ANY OF YOUR WELLS ON ARTIFICIAL LIFT, I SUGGEST YOU **GET IN TOUCH WITH OTIS** AND TALK TO THEIR GAS LIFT SPECIALISTS. WE DID, AND IT GAVE US SOME OF THE MOST ECONOMICAL AND EFFICIENT GAS LIFT INSTALLATIONS WE'VE EVER HAD. IT'S NO WONDER OTIS HAS THE REPUTATION OF BEING

"First in Gas Lift Control"

PRESSURE CONTROL · OTIS · SERVICE – EQUIPMENT

OTIS ENGINEERING CORPORATION

General Offices: 6812 Denton Drive - Dallas

Branches Throughout the Oil Country

THIS CHIKSAN MARINE LOADING SYSTEM INCREASES FLOW CAPACITY, REDUCES OPERATING COSTS FOR UNION OIL

What you see in the photo above is a Chiksan Marine Loading System on a new multi-million dollar supertanker terminal at Los Angeles operated by Union Oil Company of California. Designed to speed unloading operations, this Chiksan System has five 12 inch by 52 foot arms, three normally in crude oil and two in bunker oil service.

Each arm is capable of handling 15,000 B/H of refined product and up two 11,000 B/H of crude; a greater capacity than any method previously used by Union Oil.

Translated into faster turn around time, this increased flow capacity coupled with other savings through such factors as improved safety conditions results in significantly lower operating costs for Union Oil.

Plan now to install the Chiksan Marine Loading System at your terminal. For full information and recommendations, contact Chiksan.

100-105 PSI ACROSS THE RAIL is safely handled by the Chiksan all metal arm. In addition, smooth interior diameter reduces turbulence permitting more efficient pumping flow.

CLEAN, COMPACT DESIGN has permitted substantial construction savings in some cases through use of smaller docks to house equipment, and outboard dolphins to handle mooring lines.

#59-47

CHIKSAN fmc

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN COMPANY—Brea, California • Chicago 5, Ill. • Newark 2, N.J. • Weco (Division), Houston 24, Texas • Subsidiaries: Chiksan Export Co. • Chiksan of Canada Ltd.

most realistic allocation of joint costs would be in terms of the market impact of natural gas. But the system of federal and state regulation under which gas is brought to the market does not permit the allocation of costs in terms of the market impact.

"Consequently, a large proportion of the discovery costs must be allocated to crude oil. And this necessarily is reflected in the prices of refined oil products.

"Thus, the consumer of oil is forced to subsidize the consumer of gas. Since it bears a disproportionately small share of the cost burden, gas can enter the market with a lower price tag than oil. That permits it to capture markets from oil.

"But, by this process, gas is effectively killing off its own sponsor; it gradually saws off the limbs which supports it . . ."

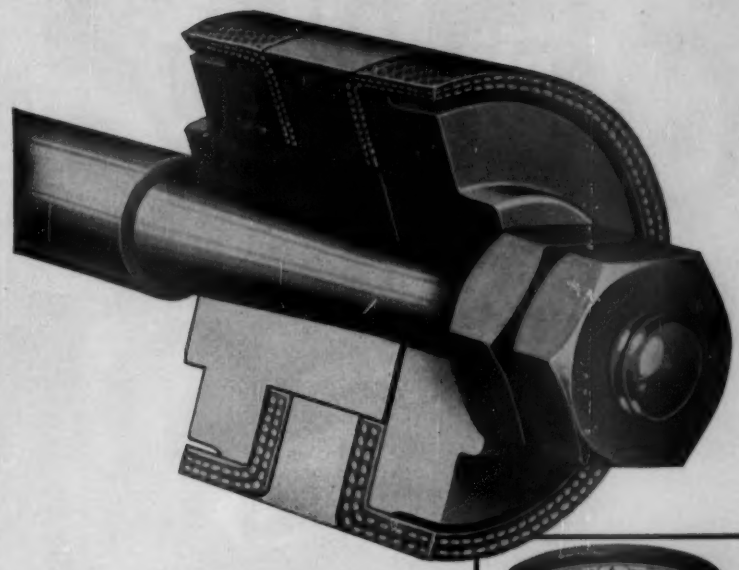
John G. Winger, of the petroleum department of Chase Manhattan Bank, in the bank's monthly review of petroleum situation.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

SEPTEMBER

- **14** American Petroleum Institute, University of Texas, seventh session of school of pipeline technology, Lee College, Baytown, Tex.
- **14-16** Texas Mid-Continent Oil and Gas Association, annual meeting, Rice Hotel, Houston.
- **15-16** American Gas Association, Southern Gas Association, eleventh annual accident prevention conference, Dinkler Plaza Hotel, Atlanta.
- **16-18** Wyoming Geological Association field conference, Big Horn Basin, registration, Cody, Wyo.
- **16-18** National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.
- **17** Natural Gasoline Association of America, Rocky Mountain regional meeting, Wyoming-Gladstone Hotel, Casper, Wyo.
- **17** American Gas Association, second annual pipeline research forum, Statler Hotel, Dallas.
- **17-18** International Seminar on Friction, Lubrication and Wear, Burgenstock, Switzerland.
- **18-19** Ardmore, Okla., Geological Society, field trip in southeastern and eastern Oklahoma, registration Sept. 17, Aldridge Hotel, McAlester, Okla.
- **20-23** American Society of Mechanical Engineers, petroleum mechanical engineering conference, Rice Hotel, Houston.
- **21-23** Texas Society of Certified Public Accountants, sixth annual institute on taxation, Houston.
- **21-23** Columbia University, oil refinery workshop on passive element analog computers, Engineering Building, Columbia University, New York.
- **21-25** Instrument Society of America, annual instrument-automation confer-



WHY PUMCUPS MAKE A DIFFERENCE

Darcova Pumcup

Darcova 45° Bevel Type Pumcup

- in reciprocating pumps
- in air and hydraulic cylinders

With Darcova Pumcups in your cylinders, there's less fluid slippage. High volumetric efficiency is maintained and Pumcups outlast other packings at least 3 to 1! There's less down-time! Lower power cost! Smoother operation! Less maintenance and replacement!

Longer life is the result of truly advanced cup engineering, including 100% nylon composition, plus a choice of types, textures and precision sizes to exactly match fluid, cylinder, pressure and temperature conditions.

These same factors contribute to prolonged high efficiency by permitting full advantage of the "cup principle". Thus fluid pressure always keeps Pumcups snug against cylinder wall, despite eventual wear, while the total frictional load is minimized.

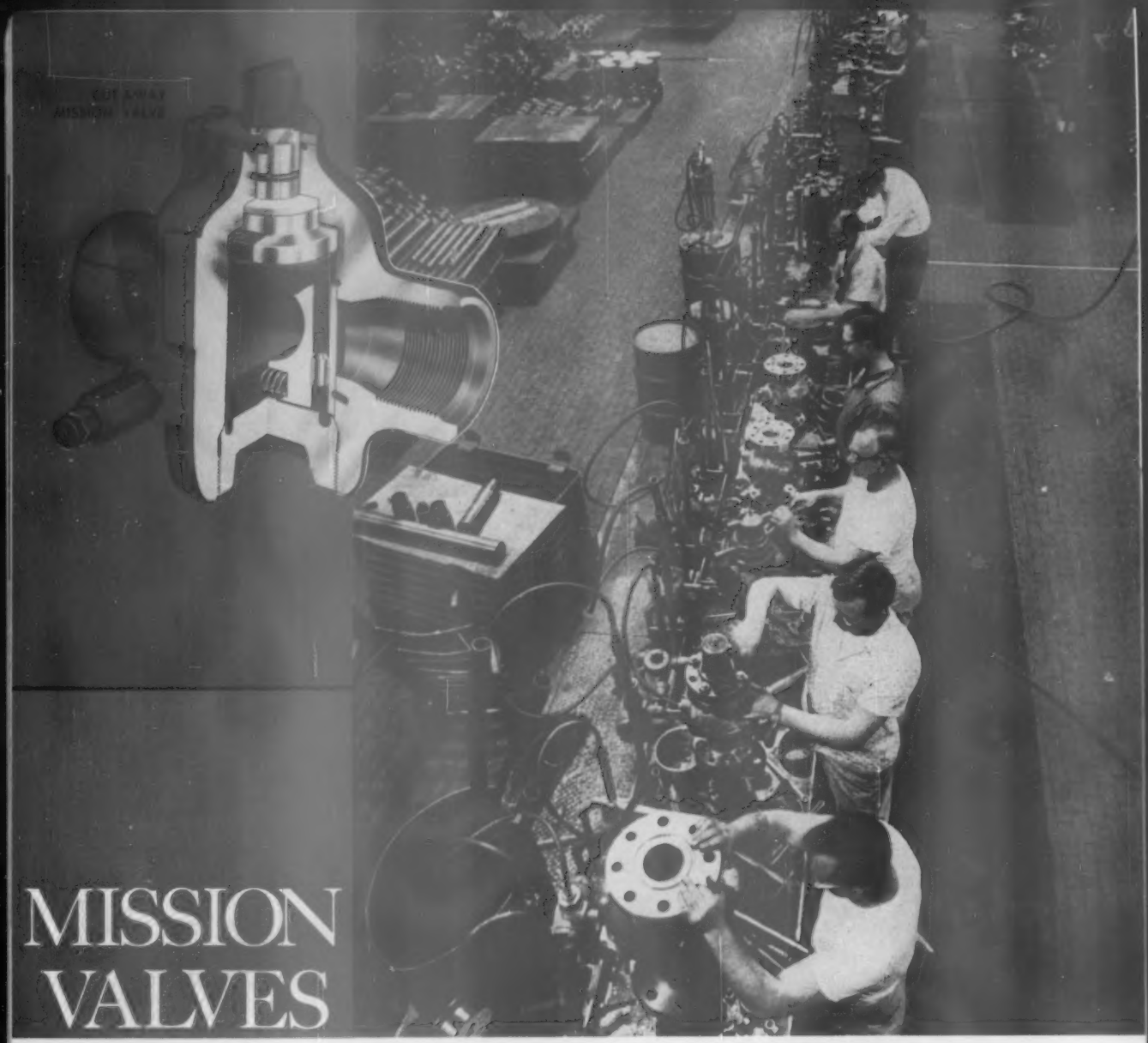
Send for Bulletin 5503. It will give you *all* the facts.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS



MISSION VALVES

protect you with a seal that works for you

Line pressure actually seals Mission Valves more tightly. The greater the pressure against the closed valve, the more tightly Mission Sealant holds—acting like a plastic packing. This automatic sealant injection system literally stops leaks before they start. This basic design, constantly improved upon, has been proved by almost twenty years in the field. Backed up by the modern manufacturing techniques of Mission's new Houston plant, you know you're getting quality. These are the reasons Mission Valves do what they're supposed to do, and do it for years with very little maintenance. There are more than 315 different valves, bringing the positive advantages of the Mission Valve to practically every application. Specify Mission and eliminate your valve problems.

For over thirty years—quality built in to last

MISSION MANUFACTURING CO

MISSION MANUFACTURING CO., P. O. BOX 4209, HOUSTON, TEXAS • CABLE ADDRESS—"MISSCO"
EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK • IN THE UNITED KINGDOM: MISSION MANUFACTURING CO., LTD., 17 HANOVER SQUARE, LONDON W. 1 ENGLAND • CABLE ADDRESS—"MISSOMAN"
PISTONS • PISTON RODS • SLIPS • GLAND PACKINGS • LINERS • LINER PACKING
PUMP VALVES AND SEATS • SWABS • VALVES • HAMMERDRILS • CENTRIFUGAL PUMPS

59-202

ence and exhibit, International Amphitheater, Chicago.

22-23 National Association of Corrosion Engineers, Shreveport, La., section, eighth annual corrosion control short course, Centenary College, Shreveport.

23-24 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

24-25 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division annual meeting, Roosevelt Hotel, New Orleans.

27-29 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Leamington, Minneapolis.

27-30 American Institute of Chemical Engineers, national meeting, Hotel St. Paul, St. Paul.

29-30 Western Petroleum Refiners Association, management seminar, Western Hills, Wagoner, Okla.

28-Oct. 1 American Welding Society, fall meeting, Sheraton-Cadillac Hotel, Detroit.

29-Oct. 1 National Association of Corrosion Engineers, western region conference, Bakersfield Inn, Bakersfield, Calif.

OCTOBER

1-2 National Association of Corrosion Engineers, southeast region conference, Jacksonville, Fla.

2-3 Association of Desk and Derrick Clubs of North America, eighth annual convention, Hilton Hotel, San Antonio, Tex.

4-7 Society of Petroleum Engineers of AIME, fall meeting, Memorial Auditorium, Dallas, Tex.

5-7 American Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

5-7 National Association of Corrosion Engineers, northeast region conference, Lord Baltimore Hotel, Baltimore.

5-10 Society of Automotive Engineers, national aeronautic meeting, aircraft engineering forum, and aircraft engineering display, The Ambassador, Los Angeles.

7-8 Western Petroleum Refiners Association, fourth annual stream pollution and waste disposal conference, Broadview Hotel, Wichita.

7-10 Rocky Mountain Association of Geologists, eleventh annual field conference, Saratoga Inn, Saratoga, Wyo.

8-9 California Natural Gasoline Association, annual fall meeting, Huntington-Sheraton Hotel, Pasadena, Calif.

8-10 American Association of Petroleum Geologists, Southwestern Federation of Geological Societies, second annual regional meeting, Coliseum, Lubbock, Tex.

8-10 Exploration Drilling symposium, sponsored by University of Minnesota, Colorado School of Mines, and Pennsylvania State University, University Park, Pa.

8-11 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

11-13 American Association of Oilwell Drilling Contractors, annual meeting, Skirvin Hotel, Oklahoma City.

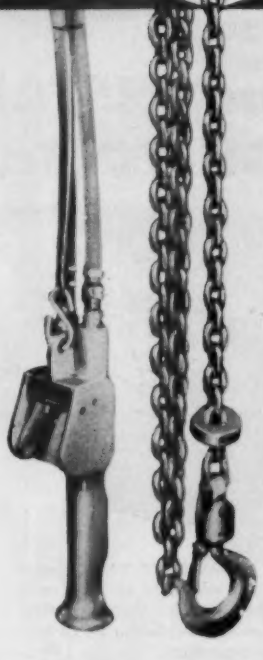
11-16 American Society for Testing Materials, Pacific area national meeting, Sheraton-Palace Hotel, San Francisco.

12-15 National Association of Corrosion Engineers, south central region conference, Cosmopolitan Hotel, Denver.

13-14 Seventh Annual Gas Measurements

Faster Load Lifting With New Coffing Quik-Lift Air Hoist

12 MODELS
lift full load 10 feet
500-pound hoist— 7 seconds
1000-pound hoist— 9 seconds
2000-pound hoist—24 seconds



Speed, accurate control, safety and long life are combined in the new Coffing Quik-Lift Air Hoist to give you efficient hoisting power.

Smooth power flow and absolute control at all speeds and loads is provided by the heavy-duty, 8-blade rotary air motor, the air-cooled disc brake and sensitive controls.

This hoist will not drop its load if air pressure fails for the brake is always engaged except when the motor is activated. If air supply fails, load can be safely lowered manually by the brake adjustment screw. The air-cooled, disc-type brake provides four times as much braking area as conventional brakes.

Free movement so that the push-button pendent control is always correctly positioned for easy use is provided by the swiveling features of the air supply hose and pendent hoses. Safety hooks, which are standard equipment on all models, swivel on roller thrust bearings.

The Coffing Quik-Lift Air Hoist is available in 500, 1000 and 2000-pound capacities —with either link or roller chain and with interchangeable manual pull-cord or push-button pendent controls. Contact your favorite supply store or write for Bulletin ADH-79.

COFFING HOIST

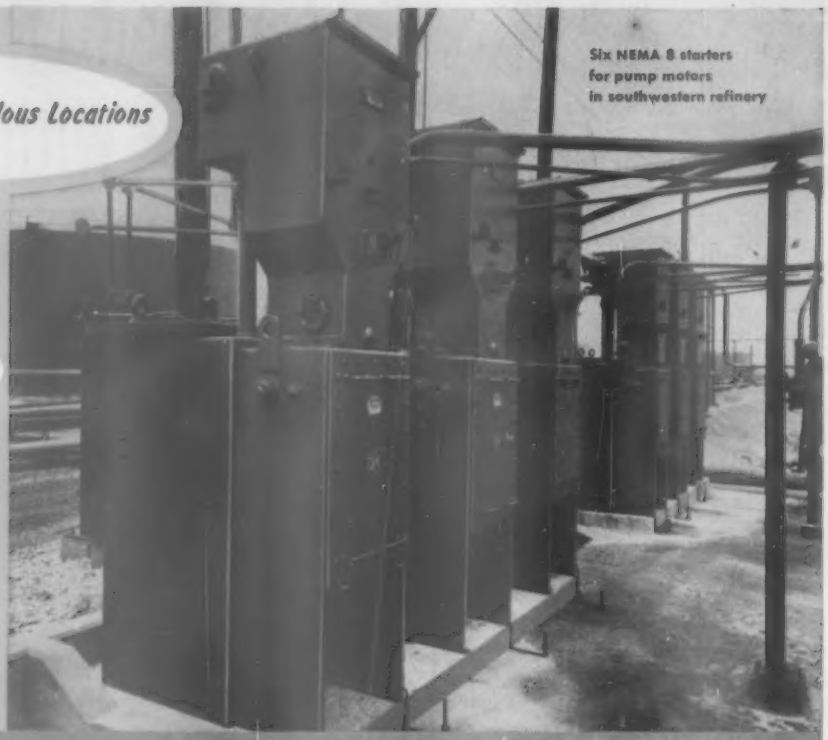
DIVISION OF
DUFF-NORTON COMPANY
818 Walter Street • Danville, Illinois

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

DUFF-NORTON

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

for Class 1, Group D, Hazardous Locations

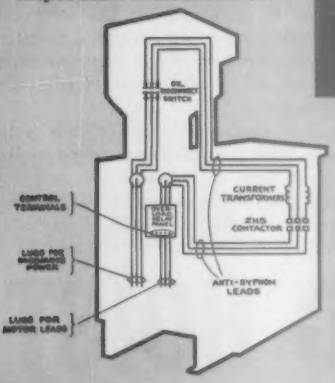


Six NEMA 8 starters for pump motors in southwestern refinery

here's how to

SAVE SPACE and INSTALLATION TIME with EC&M HIGH VOLTAGE STARTERS

SPACE SAVERS! Each of the seven starters in the eastern refinery installation *(at the right)* requires a space of only 2 ft. x 4 ft.—permitting close grouping with maximum accessibility for inspection and maintenance.



YOU SAVE INSTALLATION TIME because every ECaM starter is shipped with all internal wiring complete. *(See diagram at left)* All leads are of anti-syphon construction.

Write for Bulletin 8131 AM

These ECaM 2200-4800 volt Starters are designed for use where hazardous mixtures of air and inflammable gases or vapors are ever-present. NEMA 3R (raintight) enclosure permits mounting indoors, outdoors, or in semi-enclosed location. Load-break oil disconnect switch is self-contained and completely wired into the starter.

Available in two ratings for any power capacity. (*1*) 50,000 KVA (certified) interrupting capacity of ECaM Type ZHS Contactor. (*2*) In VALIMITOR® (volt-ampere-limitor) style... the bus may be of unlimited capacity.

THE ELECTRIC CONTROLLER & MFG. CO.
A DIVISION OF THE SQUARE D COMPANY
CLEVELAND 28 • OHIO

7936

Institute, National Guard Armory, Liberal, Kans.

16-17 University of Texas, E. P. Schoch lecture series, process control, University of Texas, Austin.

20-22 American Standards Association, national conference on standards, Sheraton-Cadillac Hotel, Detroit.

20-22 National Association of Corrosion Engineers, north central region conference, Cleveland.

20-22 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Sheraton - McAlpin Hotel, New York.

22-23 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin section, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

23 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

26-27 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-27 Independent Natural Gas Association of America, annual meeting, Westward Ho Hotel, Phoenix.

26-28 Society of Automotive Engineers, national transportation meeting, La Salle Hotel, Chicago.

27 American Institute of Chemical Engineers, New York section, technical symposium, Hotel New Yorker, New York.

28-29 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28-29 Armour Research Foundation of Illinois Institute of Technology, annual computer applications symposium, Morrison Hotel, Chicago.

28-30 Society of Automotive Engineers, fuels and lubricants meeting, La Salle Hotel, Chicago.

28-30 American Association of Petroleum Geologists, Mid-Continent regional meeting, Broadview Hotel, Wichita.

29-30 Oil Recovery Symposium on Southwest Texas, sponsored by southwest section of AIME and Texas Petroleum Research Committee, Driscoll Hotel, Corpus Christi, Tex.

NOVEMBER

4-6 Rocky Mountain Oil and Gas Association, fourteenth annual convention, Brown Palace Tower, Denver.

4-6 Institute of Radio Engineers, national automatic control conference, Sheraton Hotel, Dallas.

9-10 National Academy of Sciences-National Research Conference, first international symposium on fire research, National Academy of Sciences, Washington.

9-11 American Petroleum Institute, thirty-ninth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

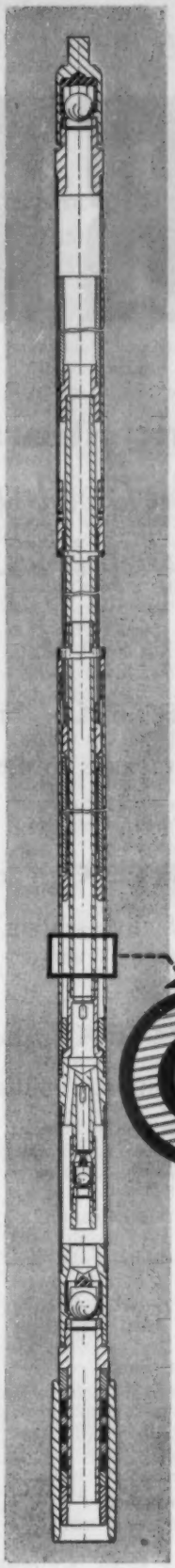
9-12 Society of Exploration Geophysicists, twenty-ninth annual meeting, Biltmore Hotel, Los Angeles.

16-20 Fifth International Automation Congress and Exposition, New York Trade Show building, New York.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

20 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

29-Dec. 4 American Society of Mechanical Engineers, annual meeting, Chalfonte Haddon Hall, Atlantic City, N. J.



Get More Production with

PACIFIC'S DOUBLE BARREL

Insert Rod Plunger Pump

This particular design of Pacific's Type "D" Insert Rod Pump is one of the many tried, and is the direct result of engineering proved by actual field tests and operation. Over a period of years this pump was developed so that it could be removed on the rods for servicing . . . yet produce at capacities equal to or greater than a Tubing Liner Pump. Many problems were encountered, but for each a satisfactory solution was found. The result is a most efficient and trouble free insert rod pump for handling large capacities.

The Type "D" Insert Rod Pump consists basically of two R. W. pumps in tandem. The upper pump is a Traveling Barrel Pump. The lower pump is a Traveling Plunger Pump.

WRITE FOR BULLETIN 204

Vertical cross sectional view of lower pump displacement chamber showing area which is between Inner Plunger Tube and Precision Tube. This area represents approximately 60% of the upper pump. Both pumps load on the up stroke and discharge on the down stroke.

PACIFIC PUMPS

Inc. . . A Division of Dresser Industries, Inc.

HUNTINGTON PARK, CALIFORNIA

Mid-Continent :
1358 So. Sheridan Ave., Tulsa 12, Oklahoma
Pacific Pumps of Canada, Ltd.,
Edmonton, Alberta

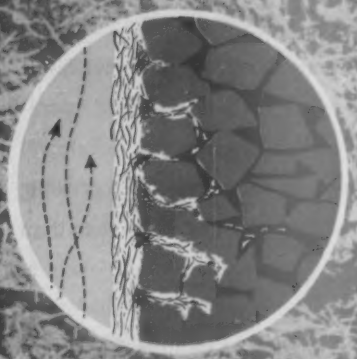
ONE OF THE DRESSER INDUSTRIES

PACIFIC®

DW-19

Seeing is believing

FIBERTEX*



SEALS FORMATION PORES

SEALS FORMATION FRACTURES

RESISTS DECOMPOSITION

strong fibers *permit mud circulation without loss.*

FIBERTEX . . . bridges formation pores and blocks fractures to prevent or stop mud loss.

FIBERTEX . . . graded fiber sizes give quicker, more effective sealing.

FIBERTEX . . . mixes easily, works fast, resists decomposition. A little goes a long way.

BAROID

BAROID

BAROID DIVISION
NATIONAL LEAD CO.

Main Office: P. O. Box 1675, Houston 1, Texas

*Registered trade mark, Baroid Division National Lead Co.

5906

the Journal said...

50 years ago

September 20, 1909

Prairie Oil & Gas Co. is reported to have arranged with Midland Valley Railroad to load 50 cars (about 10,000 bbl.) daily of Oklahoma's Muskogee and Glenn Pool crude for delivery to Standard Oil Co. of Louisiana's new Baton Rouge, La., refinery, due to start operation next January. Available Louisiana crude inadequate.

Ohio Oil Co. acquires 6,000 acres of prime oil land and 455 producing wells in the Illinois field in a $3,000,000 deal, one of the petroleum industry's largest to date. Sellers are Jennings Producing Co., whose Jennings Brothers owners have been identified closely with Pure Oil Co., and Kenawha Oil Co. Properties are in Crawford, Clarke, and Lawrence counties.

25 years ago

September 13, 1934

Utah's hope for an important oil field are enhanced by a 30 M.M.c.f.d. gas flow encountered at 2,747 ft. in a rank wildcat test (1 Weightman) being drilled by Ramsey Petroleum Corp. on Last Chance structure in Emery County. Gas is in a zone just above the horizon in which oil is expected.

Centralized authority set up to coordinate activities of three government agencies in controlling oil production and enforcing regulatory statutes in East Texas field. Elimination of red tape expected to expedite action against hot-oil operators and check mounting overproduction.

Discovery of new field (Kittrell), the first in Houston County, East Texas, starts intensive lease play through southern half of that county, adjoining northern Walker County, and eastward through Trinity County. Boone Brothers' discovery well (1 Trinity) flowed high-grade dark-green oil from Carrizo sand at 2,029-36 ft.

10 years ago

September 15, 1949

First commercial production found in the Gulf of Mexico off the Texas coast since the war comes in. Stanolind Oil & Gas Co. (Pan American) 1 State Lease 31,700, off High Island, Galveston County, flows 5,122 M.c.f. of gas and 48 bbl. of condensate per day through ¼-in. choke from pay at 5,964-68 ft.

South America's drilling depth record raised to 15,637 ft. by wildcat Colon Development Co. (Shell) is putting down on Rio Catatumbo, south of Lake Maracaibo, in western Venezuela. Previous record, in a Shell well in the Boliver district, was 15,106 ft.

JOURNALLY SPEAKING

Displaced Persons

THIS IS a tough year for executives, boy oh boy.

Just think of all the oil-company officials that have been put out of jobs as the result of mergers and consolidations!

Not to mention area managers, department heads, section chiefs, and assistants all down the line.

There can't be two identical titles on the organization chart, you know, so when there's a consolidation a lot of people get bumped. There aren't enough new titles to pass around to everybody. So when a merger takes effect, one president, manager, purchasing agent, chief counsel, etc. often has to either step down and become a vice or step out and become an ex.

This Jersey Standard consolidation recalls an old half-truth, half-joke to the effect that when a chairman of the board died, Jersey hired a new office boy and everybody else moved up one notch.

'Taint so any more. Now even board chairmen are getting laid off wholesale as their boards, corporate entities, and company names are abolished. When a board chairman decides to merge, everybody else moves down several notches.

If the urge to merge keeps up at the pace it's been going the past year or so, somebody should start a fund for the care and feeding of displaced persons and refugees from consolidations in the oil industry.

We were about to crack that oil-company executives ought to form a union to protect job security and craft rights. But then we realized that the same thing is happening to union members and that's what all the strikes are about.

The major issue, you know, in the labor disputes in the steel, refining, and other industries is the right of management to get more units of output per payroll dollar by revising job assignments and shifting personnel duties.

Union members don't like to have their jobs merged out of existence any more than company presidents do. And it's just as humiliating for a master electrician, say, to become a "general maintenance man" as it is for the president of a company to be downgraded to "area manager" as the result of a consolidation.

The unions make more fuss about it than the executives, and put up more resistance—at least in public. (We seldom hear much about the internal battling for job security and title prestige among executives involved in a merger, but it must be plenty.)

In the steel strike, for instance, the union is making a strong fight to retain what is known as "local practice rules" in the work contract. This means, roughly, that things are expected to continue in the future just about the way they always have been in the past. A similar resistance to changes that might eliminate jobs, titles, or promotion escalators, runs through most labor negotiations.

But we have a hunch that, in the long run, neither the blue-collar union workers nor the plush-officed executives will be able to retain the old concepts of job security in the face of the trend toward more efficient operation. Nor will the ranks of junior executives and white-collar workers in between.

The booming prosperity of the postwar decade, with its reaction to the end of the wartime manpower shortage, brought on a lot of lazy, wasteful, inefficient habits throughout all business. Crews, teams, and committees spent hours and days doing jobs that one good man (or one good machine) could do in half the time.

Now the profit pinch is on, and competition is much keener, and companies everywhere are taking steps to streamline their organizations from top to bottom to get faster and more efficient action. In the process, some jobs—and a lot more titles—get eliminated.

It's the modern trend, and it's hitting executives just like union members.

Oh migosh—a horrible thought just struck us. Do you suppose this trend could extend clear to our job? Will they come to streamlining and consolidating oil writers? Maybe we better start turning out two of these columns every week instead of just one, or we, too, may become one of today's displaced persons.

—Henry D. Ralph.

Formations in the Tri-State area of Illinois, Indiana and Kentucky continue to respond to treatment with Dowell special acids.

MAKE YOUR WELLS WORTH MORE

Treat Them With Special Acids By Dowell

In many wells that are suitable for acidizing, problems are encountered that make special acid formulations necessary.

Your Dowell engineer can help you—in many ways—to select the special acid and the treatment technique designed to give profitable results on these wells.

First, he can help you define the problem. He can have samples of the formation and the produced fluid analyzed. He can help you study the reports and decide just what the problem is.

Next, he can help you select the addition agents to make the special acid formulation needed for your well.

Then he can study other well characteristics. He can help you decide on the size of the treatment and the injection rate required. If stage treatments are needed, he can help you arrive at a procedure to be followed. He provides you with Dowell's vast experience in acidizing.

Because every well is different, Dowell offers dozens of addition agents. They may be combined in hundreds of ways to meet almost any special problem. In the box at the bottom of this page, you can see how some of the most popular special acids are used to acidize problem wells.

For prompt service, or detailed information call your nearest Dowell representative. There are more than 165 locations to serve you in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

How Special Acids By Dowell Help You Get Better Results From Problem Wells

If you want to acidize an old water input well—

STABILIZED ACID will probably save money and trouble. Iron salts, either from the injection water or from corrosion, may be present. If regular acid is used, insoluble iron hydroxide may precipitate and plug the formation as the acid spends. Stabilized Acid contains an addition agent to keep these salts in harmless solution.

If your producing formation is "dirty"—

SILICATE CONTROL ACID contains an addition agent that shrinks water-swollen clays or prevents their swelling during treatment. In addition, it is designed to break emulsions. In many instances, Silicate Control Acid has given excellent results in fields where regular acid actually reduced production.

If you want to acidize a fast-reacting limestone—

ONE OF DOWELL'S RETARDED ACIDS may give improved results by increasing the effective drainage area. These acids are especially useful in fractured, oolitic or vugular formations.

If you expect more than one problem—

USE A DOWELL "SHOTGUN" ACID. These acids generally contain at least three addition agents—to improve penetration, combat emulsions, and prevent silicate swelling. They have given good results in many problem wells. For example, they have been especially helpful where clay-triggered emulsions limit production.

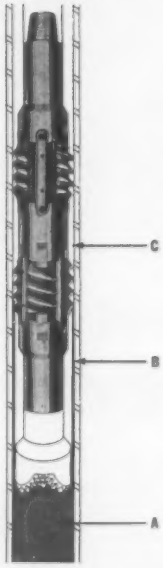
If you are not certain what the problem is—

Or, in any case, let your Dowell engineer help you study the situation and decide on the proper treatment. One of the other Dowell special acids will probably provide the answer—BDA* (Breakdown Acid), Mud Acid, Channeling Acid, Intensified Acid, Heatblast*, Dry Acid, plus modifications of each. Take advantage of Dowell's 27 years of experience in oil well acidizing by calling a Dowell engineer in your area.

*Dowell Trademark

NOW—THE "ACID GUIDE"! NEW, IMPROVED ENGINEERING ADVANCE IN ACIDIZING. ASK YOUR DOWELL ENGINEER FOR DETAILS.

your WELL'S FUTURE LOOKS GOOD when the **"WORKING SURFACE"** of the **CASING** is **CLEAN!**



A – Cement to be drilled out.
B – This thin cement sheath, which remains after the bit has passed, often interferes with future operations.
C – Cement sheath and ALL other obstructions removed by the Baker ROTO-Vert Casing Scraper. The vital I.D. of the casing is left clean and smooth, safe for all future down-hole operations.

It's simple and inexpensive to run a Baker Casing Scraper just above the bit when drilling out cement, or following perforating operations, to provide a bright future for your well.

No obstructions will remain to cause premature setting of close-tolerance tools. Rust, mill scale and paraffin will be scraped away, and there will not be any sharp burrs to slash and ruin swab rubbers or affect the performance of packing elements on testers, packers and cement retainers. Even the thin, brittle cement sheath which prevents the slips of pack-off tools from gripping the casing, are scraped away.

Thousands of runs have proved the Baker ROTO-VERT Casing Scraper to be both positive and safe in cleaning up casing I. D. easily and at low cost.

Available from the Baker Servicepoint in your area, on a rental basis.

BAKER OIL TOOLS, INC. HOUSTON LOS ANGELES NEW YORK

Coal wants to set oil and gas policy

CONGRESS has just passed an innocent-appearing bill to create a Coal Research and Development Commission. Its purpose is to expand markets for coal.

This is the first accomplishment of the recently formed National Coal Policy Conference. This group is now pushing for enactment of a second bill, this one to create an official "national fuels policy." Already more than a score of senators have signed as cosponsors.

A national fuels policy may seem like a good idea to the uninitiated. But it could contain serious traps and jokers. The oil and gas industry should watch this development most critically.

IT IS SIGNIFICANT that the push for a national fuels policy comes almost entirely from the coal industry, an industry which has long bucked petroleum progress, attempted to block construction of oil and gas pipelines, and checkmated revision of the Natural Gas Act.

Some plausible arguments for a national fuels policy are made by spokesmen for the National Coal Policy Conference as long as they talk in generalities. But when they come down to specifics they list these objectives:

- Balance the use of fuels with their varying reserves.
- End the dumping of residual fuel oil on the East Coast.
- End the dumping of natural gas for industrial uses.

So the real purpose turns out to be end-use control, with the Government telling people what fuels they may and may not use for specific purposes. And the vague and patriotic-sounding objectives of a national fuels policy are exposed as another attempt by coal to hamstring the competition of oil and gas by legislation.

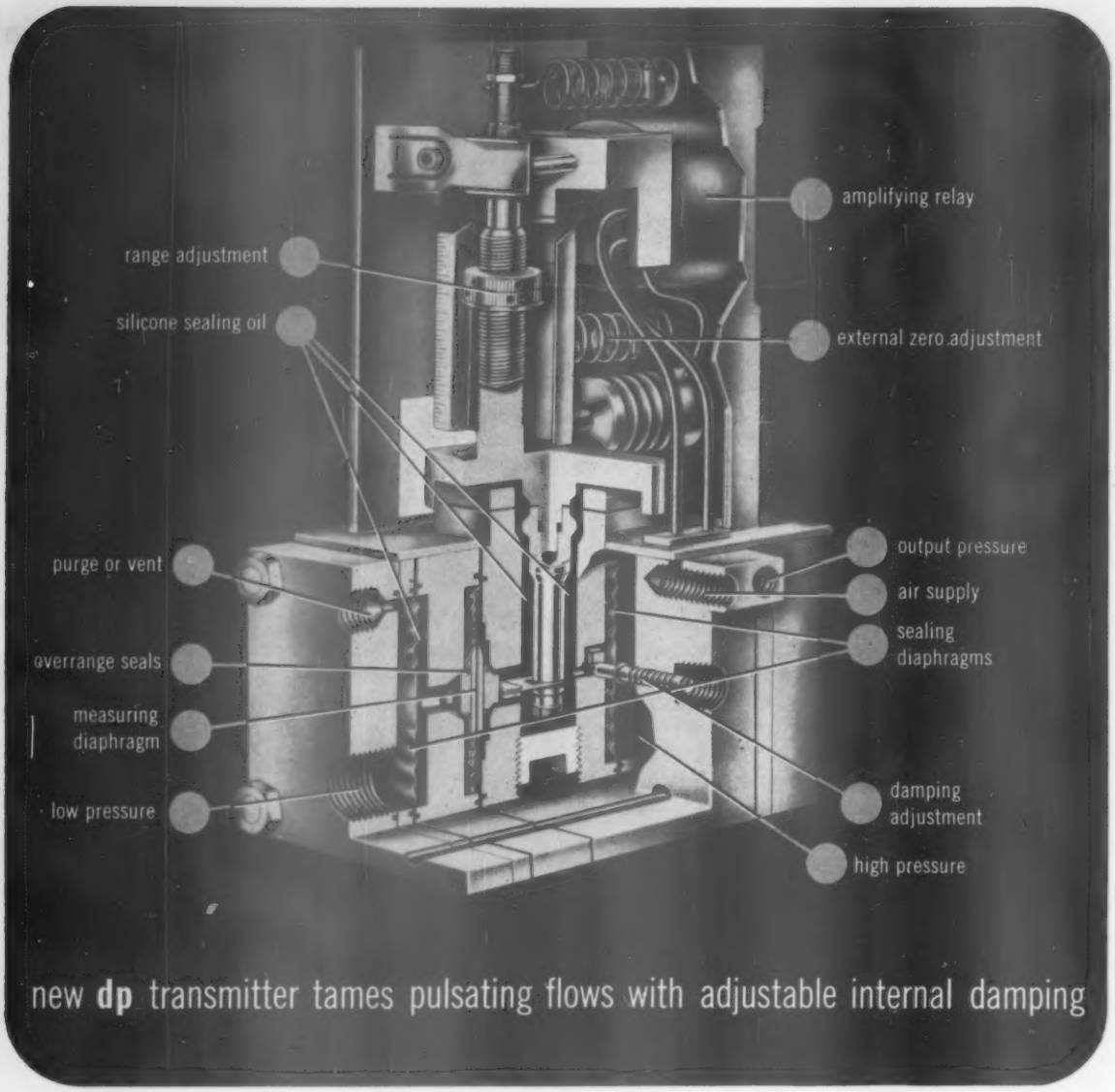
It is good that a once-sick coal industry has revived and is now fighting for markets. But let it fight on the basis of price, service, and efficiency in an open competitive market, not with paternalistic laws or blanket allegations that competitors' prices are "dumping."

A fuels policy should be a policy, not a detailed regulatory ordinance. It should embody broad, long-range objectives, not specific remedies for local or transitory problems.

BUT WHY DO WE NEED a new national fuels policy? Why not adhere to the fuels policy this country has had for 150 years? Perhaps it has never been documented as such, but it is basic, simple, and workable.

This policy is free enterprise, fair competition, minimum regulation, and preference for domestic over foreign supplies.

This policy has given America an abundance of energy fuels at low prices, and made it the industrial leader of the world. Occasional deviations from this policy have created more problems than they solved. Any attempt to change this policy should be viewed with suspicion.



new **dp** transmitter tames pulsating flows with adjustable internal damping

Not long ago, F & P engineers set about building a better differential pressure transmitter. Their main purpose: to obtain dp transmitting of the highest accuracy and dependability by providing adjustable internal damping, maintenance-free operation, and superior calibration stability. Their design approach: keep the process fluid out of the measuring system.

An examination of the illustration above reveals how the input pressures, applied to the sealing diaphragms, are transmitted to the measuring diaphragm by silicone sealing oil. Adjustable internal damping is achieved by a needle valve which restricts the flow of sealing oil. This ensures fast response to full changes in differential pressure, yet isolates the force balance system from extraneous impulses. Pulsating flows present no problems for this transmitter. And since the needle valve is in the clean sealing oil, its operation is trouble free, regardless of the amount of damping required.

The unique and revolutionary design of this new dp transmitter makes it well worth investigating. Contact the F & P field engineer nearest you for a demonstration or evaluation unit, or write for Catalog 10B1465. Fischer & Porter Company, 3199 County Line Road, Hatboro, Pennsylvania. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Downsview, Ontario.

FP FISCHER & PORTER COMPANY • *complete process instrumentation*

What FPC Faces in the Phillips Case

• All intervenors unanimously are opposed to Zwerdling's public-utility formula of setting producers prices. Even the purchasers who earlier favored the ruling are now ready to present oral arguments when the case goes before the full commission October 1.

WHEN intervenors in the Phillips gas case make their oral arguments before the Federal Power Commission October 1, one fact will stand out:

No big gas buyer likes the method of setting producer's prices as recommended by Examiner Joseph Zwerdling.

Many of the purchasers who fought so hard to have producers regulated strictly on a public-utility formula are now bitterly disappointed with the results of the first test case.

Most of them still defend the principle of cost-of-service approach. But they will ask FPC to depart from the utility method when it comes to setting Phillips' prices.

Oral arguments probably will follow the printed exceptions filed by the pipelines and other intervenors.

As predicted (OGJ, July 27, p. 156), almost all intervenors object to the examiner's flat-rate, or "postage stamp," price schedule which would raise Phillips' prices to many customers in order to reduce them to others.

Supplement the cost study with other factors when it comes to setting specific prices for any contract, the intervenors' briefs tell FPC. They list a wide variety of reasons to support their stand—all of them the same or similar to arguments producers have been making for years. Even the once-despised "fair field price" formula is beginning to look good to some of the intervenors.

The exceptions listed to the examiner's findings are often conflicting. Getting general agreement on all the views presented is impossible. That fact may cause the FPC to see some merit in Panhandle Eastern Pipe Line Co.'s view of the case.

Panhandle's recommendation: Dismiss the proceedings and forget the whole mess.

Doubts on costs . . . At the beginning there was just one big issue in the Phillips case: How to compute a producer's costs.

The examiner's decision pointed up a second big issue: How to translate a producer's costs, no matter how determined, into a practical price schedule.

Now the appeals of some of the pipelines present FPC with a third big issue: How much weight, if any, it should give to costs in setting "just and reasonable" prices for Phillips' various customers.

This third issue, of course, is really the first issue. But for 5 years nearly everybody assumed that it had been settled—that FPC was going to set producers' gas prices by the traditional public-utility cost-of-service method.

Now, practically everyone is requesting some change from a strict and literal application of the utility method.

In the new line-up of these issues, Phillips itself stands in what might appear to be a strange position. It professes to have no opinion as to whether or not the cost method should be used and whether its prices should be uniform to all purchasers.

Phillips insists that if the cost method is used, the FPC should set prices that will return all its costs. Therefore, Phillips lists exceptions to the examiner's findings which resulted in a cost figure lower than the way Phillips computed it (OGJ, Aug. 10, p. 62).

But Phillips does, with studied casualness, mention some of the problems involving the entire industry should the examiner's recommendations be adopted. Its strategy may be to confine its own case to its own figures and let the advocates of utility-type prices stew in their own juice until they are ready to champion another method.

Raising low prices . . . The proposal to raise prices that are below Phillips' cost of service is called illegal by most of the gas purchasers.

The argument is that FPC can't impose a price that returns less than cost, but it has no authority to raise such a price voluntarily agreed to unless it is discriminatory among purchasers or impairs the seller's ability to remain in business. And no such showings have been made as to Phillips' low prices.

The buyers make a big fuss about voiding contracts made by arms' length bargaining in good faith and about upsetting established business practices and historic price patterns. They are largely silent about applying the same arguments to cancellation of Phillips' contracts containing prices higher than its average costs.

Uniform prices . . . Universally condemned is the proposal for uniform prices—variously described as system-wide application, rolled-in costs, or postage-stamp rates.

There is no point in uniform prices since all buyers and all locations are not in the same class, it is contended. Phillips is not a "system," and additions to its facilities in one area don't benefit customers in another area.

It is a windfall to some buyers, a penalty to others, and hence discriminatory. It destroys the right to bargain for an initial rate, and hence is illegal. It is unfair to producers and will encourage intrastate sales. And variation in prices does not discriminate among purchasers except where it takes place within a single producing area.

Exploration costs . . . The argument that old prices should be raised to encourage exploration in new areas drew fire from many intervenors:

They contend the public interest intended by the law is the interest of present consumers, not future ones, not the health of the whole gas industry nor the nation's total gas reserves. Buyers in old, low-cost areas have no obligation to finance new exploration for others. Let new contracts reflect the rising cost of finding new supplies.

Perhaps surprisingly, the State of Wisconsin suggests a middle ground.

Frederick Stueck Arthur Kline Jerome Kuykendall John H. Hussey William R. Connole

THE FPC will hear oral arguments on the controversial Phillips case October 1. Several intervenors are prepared to attack Examiner Joseph Zwerdling's recommendations of setting producers' prices on a public-utility formula.

It doubts that a uniform price—which is both a floor and a ceiling—will encourage exploration. It says it is unfair to small producers, destroys bargaining power, and amounts to subsidization of high-cost production.

The cost method . . . Use of producers' costs as the basis for regulation is defended by most intervenors, but with varying degrees of enthusiasm.

Many take issue with some of the examiner's computations that gave Phillips a break on costs. But in general they conclude that, for all its "infirmities," the cost method must be nailed down as the basis for regulation.

Michigan Wisconsin Pipe Line Co. has a few doubts. It says the Phillips computation does not hurt it badly at present, but the method could result in much higher rates in the future.

Southern California Gas Co. urges immediate adoption of the cost method to stem the alarming rise in producers' prices, with consideration of other methods to come later.

The most important aspect of this case, it says, is recognition that field prices can be related to costs, at least as far as major independent producers are concerned. It suggests some other method—or no control at all—may be devised for the smaller independent producers.

Northern Natural Gas Co. doesn't directly condemn the cost method. It says that before adopting a new pricing policy FPC should study all methods of setting just and reasonable producer prices.

Several intervenors make the point that since Phillips is a financially able company there is no reason why every one of its prices should be tied directly to its over-all costs.

Area prices . . . Everybody seems to want FPC to set prices by producing areas rather than on the basis of an individual producer's company-wide costs.

Some, including the FPC staff, want the case reopened to determine Phillips' costs by major producing areas and use these figures for Phillips' maximum prices. Others hint that Phillips' own costs in any area should be only one of many factors to be considered and that the objective should be more or less uniform prices for all producers within the same area.

The list of "other factors" suggested is long and varied. It points up gas purchasers' growing uneasiness over application of a strict utility formula to producers.

Here are some of the things the pipelines say should be considered in addition to—or perhaps instead of—a producer's costs:

Date and term of the contract; size of the reserve dedicated; provisions for escalation of price renegotiation; tax sharing; B.t.u. content; take-or-pay requirements; proximity of supply; competitive considerations; the intrastate market; state conservation requirements; deliverability of the wells; industry pricing patterns; prices of competitive fuels; existing contract provisions; established business practices; existing area field prices.

Panhandle's solution . . . Unique among the appeals is that of Panhandle Eastern. Says Panhandle:

. . . The only thing the examiner has proved is that the cost-of-service or rate-base method is completely unworkable. He didn't find true costs. But even if he had, the figure would have been the over-all cost of Phillips' gas operations and not the cost of serving any one of its contracts or customers.

. . . A uniform company-wide price schedule is illegal, impractical, and nonsensical. It will stop exploration and will divert gas to the intrastate market.

True, there is not enough evidence in the record to justify setting prices on an area basis, but there is even less to justify a uniform price. The problem of area pricing listed by the examiner simply proves how impractical it is to use any cost approach.

. . . Since the 1954 test year, Phillips' new contracts and escalations under old contracts (mostly suspended pending the outcome of this case) bring it additional revenue almost exactly equal to the deficiency the examiner found to exist in 1954. So FPC could take care of Phillips' revenue needs without voiding any contracts or upsetting the industry's methods of doing business simply by letting Phillips' contracts go into effect.

. . . The commission should dismiss its general investigation, find that Phillips' prices have not been shown to be unjust, unreasonable, or unduly discriminatory. Then the FPC could take up individually any complaints gas purchasers may have about specific contract terms such as spiral escalation clauses.

Gasoline Tax Hike Voted

. . . as temporary move to finance road program. Permanent solution on who will pay still hasn't been made by Congress.

WHILE Congress was wrapping up legislation last week to hike the federal gasoline tax 1 cent a gallon, it was clear that a permanent solution on who is going to help pay for the nation's new highway system had not yet been reached.

The new gasoline tax, to become effective October 1, would run for 21 months. At that time—July 1, 1961—it would be replaced by earmarked funds from excise taxes on automobiles and on auto parts and accessories.

That is the way the script reads now, but a great many observers doubt that the script will be followed all the way. With new tax sources hard to find, "temporary" taxes have a way of becoming permanent—and of being raised again when shortages crop up.

However, considerable effort is being made to make the tax burden more equitable, and Congress has committed itself to investigate such possibilities between now and July 1, 1961.

Who benefits? . . . Congress may get some guidance from studies now being made by the Commerce Department to determine more accurately just who benefits, and how much, from good roads.

The Bureau of Public Roads has completed a survey of traffic volume by users. From this it hopes to determine how much of the highway traffic is made up of trucks, busses, business cars, tourists, local driving, and long-range trips.

It is also making a study to determine nonuser benefits. This is an exploration of the theory that a person doesn't have to use a highway to benefit from it. It's something akin to the theory that everyone benefits from public education whether he has children in school or not.

Obviously, the bureau doesn't expect to arrive at a precise percentage of cost figure each class of nonuser should pay as his share of the highway program. It does intend, however, to give case history examples of nonuser benefits and hopes to establish an overall percentage figure for nonusers as a whole.

How to collect . . . The bureau probably will not propose specific taxes or distribution of taxes. It will leave that hot potato up to Congress itself.

Even so, the study of user benefits could set the stage for some changes in special taxes supplying the highway trust fund. For the nonuser share, it is likely proposals will be made to tap the Government's general fund. Just what percentage of the total road cost would be paid from this source will depend largely on how well Congress is convinced that the general public benefits from improved highways—and whether Congress considers this approach a politically expedient one.

The eventual cost . . . The Commerce Department will also have revised cost estimates in the report it has been asked to make to Congress by January 1, 1961.

There is some fear that the revision will be sharply upward, far exceeding original cost estimates. If so, you may be sure that the "temporary" gasoline tax will not be permitted to expire in 1961. It might even be increased.

Right now, though, Commerce's highway officials don't expect any big increase in cost estimates. But they do concede that construction costs have climbed since the earlier estimates were made. And any steel price hikes as a result of a steel strike settlement could, coupled with higher labor costs, prove a further boost to highway building expenses.

Congress apparently became convinced this summer that the public generally wants the highway program kept on a pay-as-you-go basis. Thus, any cost increase would be met only by higher taxes or by curtailment of the highway program.

At any rate, the oil industry's hope for equitable tax treatment may depend to a considerable extent on the type of report the Commerce Department drafts between now and January 1, 1961.

Strikes Spawn Court Suits, Stalled Talks

FAILURE mocked attempts last week to end three major refinery strikes while court action involving picketing erupted in two disputes.

The breech apparently widened between management and labor in the American Oil Co. refinery shutdown at Texas City. A federal labor conciliator, however, continued trying to bring the opposing forces together.

The company asked the District Court in Galveston for a temporary injunction restraining members of the Oil, Chemical, and Atomic Workers Union from "molesting persons entering or leaving" the refinery.

Supervisors are now operating the plant at about 75% capacity and are processing 100,000 bbl. daily of crude.

Return delayed . . . The company said that because of threats of violence, it is not recalling at this time nearly 200 employes who have expressed a desire to return to work.

All the 1,250 strikers were asked in a form letter whether they wanted to go back to their jobs.

The strike began July 1 over a dispute on work assignments.

In its petition to district court, Amoco said the persons leaving the refinery "have been threatened and attacked."

James O. Hubbard, labor conciliator, arranged for negotiations to resume last week after an earlier effort to get them going again was called off by the company because of reports that a supervisor had been injured by strikers.

Other fronts . . . Talks also were stalled at Amoco's El Dorado, Ark., plant and at the Sugar Creek, Mo., plant of Standard Oil Co. (Ind.), the parent company of Amoco.

Earlier hopes for a quick settlement of the El Dorado strike faded last week, and no further negotiating sessions have been scheduled.

The company, however, filed a request for an injunction against mass picketing and threats of violence at the struck plant. Request for the writ was filed in Union Chancery court in Camden. The action is similar to the suit filed in Galveston.

Negotiations were resumed last week by OCAW and Indiana Standard management in the Sugar Creek walkout, but no progress was reported by either side.

New Oil Public Affairs Post Created

• Mid-Continent Oil and Gas Association is hiring executive vice president who'll try to develop the industry's leading fact-finding office in Washington.

JOE T. DICKERSON, who retires as president of Shell Pipe Line Corp. on January 1, will take over a newly created job with the Mid-Continent Oil and Gas Association.

He will become executive vice president with the task also of beefing up the association's activities with Congress, federal agencies, and the nation's press.

While he will have offices in Washington, Dickerson also will have an office in Houston, where he will continue to live, and will preside over the association's headquarters in Tulsa.

The association, with 9,000 members in eight states, has no executive vice president to serve as a continuing and cohesive force under the annually elected president for the five division associations, the Tulsa headquarters, and the Washington office.

Clarel Mapes, secretary-treasurer of the association at Tulsa, and Claude Wild, attorney in Washington, will continue in their present capacities.

Dickerson will maintain an office in Houston in the Oil and Gas Building adjacent to the offices of the Goldston Oil Co. William J. Goldston, president of Goldston Oil, is also president of the Mid-Continent Oil and Gas Association and will work closely with Dickerson.

In Washington, Dickerson will augment the association's staff, which currently consists only of Wild and a secretary.

Not a lobbyist . . . Dickerson said that while he may have to register as a lobbyist, he does not intend to become a lobbyist as such. Instead, he will gather and disseminate information on the industry to lawmakers, to federal officials, and to newsmen.

"We are taking this step in the hope it will give the industry better, more complete, more positive representation in Washington," he said.

Dickerson cited the attacks on the depletion allowance as one field where the association can be effective in defending the industry.

Goldston said that the member divisions of the associations, through their representatives on the board of directors, are solidly behind the new expansion move and will provide the needed finances starting with the 1960 budget. The exact amount will be decided when the budget is approved.

Goldston said he hopes the new setup in Washington will be "the" oil industry office in the national capital for providing information to officials and the public. Dickerson said he plans to spend the week of September 28 in Tulsa headquarters with Mapes and then spend a week in Washington with Wild. He will not take over his new job officially until January 1.

Veteran oil man . . . Dickerson, 60, has spent virtually all his working life in the oil business.

Born at Marion, Kans., he moved to Oklahoma when a boy, attended Central State College at Edmond, and received a law degree from the University of Oklahoma in 1921.

After practicing law 2 years is Osage County, Oklahoma, he joined the legal department of Skelly Oil Co. in Tulsa. After 4 years he moved into Shell Oil Co.'s legal department in Tulsa.

He moved to St. Louis in 1937 to manage the head office legal department and become secretary of the company. When headquarters was moved to New York, Dickerson moved to Houston as manager of the legal department.

In 1942, Dickerson entered the Army and rose from captain to lieutenant colonel in combat intelligence and had the doubtful honor of bombing his company's refineries in Europe on two of seven combat missions he flew. The first shell target was at

Joe T. Dickerson
. . . new spokesman in Washington.

watching WASHINGTON

Clyde La Motte

A strange way to hold gas prices down . . .

ALMOST ANY APPROACH to natural-gas regulation has its pitfalls, as the harassed Federal Power Commission can testify.

For instance, the FPC's apparent determination to hold the line on area prices could lead to some ridiculous situations.

It is entirely possible that the FPC may find itself turning down a cheap supply of gas near a given market and approving a costlier supply for that same market from fields hundreds of miles farther away.

Impossible? Not at all. Consider the current Transwestern Pipeline Co. case.

Transwestern, wanting to sell to the expanding California market, contracted for gas supplies in West Texas and adjoining areas. Then it sought FPC approval of its plan to build a Texas-to-California pipeline.

Ploesti and the second at Budapest.

Dickerson later recalled that he wrote a letter of "explanation" to Shell's president and found him "very understanding."

After the war, Dickerson became assistant secretary of Shell Oil and manager of the legal department in New York. A year later he returned to Houston as general attorney on the exploration and production regional staff. Then, in 1947, he became Houston area manager in charge of exploration and production.

Dickerson became vice president of Shell in 1951 in charge of exploration and production in West Texas and southeastern New Mexico, with offices in Midland.

His appointment as Shell Pipe Line president came in 1954.

Gulf Plans Two More Floods in McElroy Field

GULF OIL CORP. will soon kick off two more test water floods in sprawling McElroy field of West Texas.

The new projects will hike the number of Gulf floods in the field to four. The first two, Gulf feels, have proved already that a pattern-type flood will substantially hike ultimate oil recovery from the pool's 2,900-ft. Grayburg pay.

But the company, a Gulf engineer says, needs added data to fix upon the optimum plan for flooding the entire 26,000-acre reservoir.

Gulf now is awaiting approval of its plans by the Texas Railroad Commission. It has given no estimate as yet of the volume of extra oil it expects the floods to add to primary recovery from the pool.

Field an oldtimer . . . McElroy, one of the oldest fields in West Texas, was discovered May 15, 1926. It is located on a north-south trending anticline cutting across the boundary between Crane and Upton counties. The reservoir dips sharply to the east, gently to the west.

Gulf started its first pilot flood in the field in March 1947 on its J. T. McElroy lease in Section 201. It is an inverted seven-spot with one input well and seven offset producers. The company had injected a total of 1,051,546 bbl. of water in this project as of August 1 this year. Current input rate is about 250 bbl. daily at 400 psi.

The second test was launched April 1953 in Sections 200 and 201. This is a 20-acre, five spot. As of August 1, the four injection wells had taken a total of 5,469,442 bbl. Average input rate now is about 900 bbl. daily per well.

The new tests . . . The third pilot will include two five-spot patterns enclosing 80 acres and influencing an area of about 240 acres in Section 215.

This area is relatively new—its first well drilled August 20, 1955—and now in the intermediate stage of depletion. There are 17 wells in the project area. Six wells will be converted to input service.

Cumulative production from the project area as of August 1 was 474,244 bbl.

Gulf's fourth flood will comprise one five-spot enclosing 160 acres and affecting about 640 acres in Sections 199, 200, 201, and 202.

Project area is in late stage of depletion.

Cumulative production came to 11,547,977 bbl. as of August 1.

A gas-injection project in this area earlier proved a bust. Soon after the start of injection in March 1947, gas-oil ratios of offset wells started increasing, and sour gas began to plug the formation. About 50,000 M.c.f. of gas was injected before the project was stopped in February 1948.

About 2,000 bbl. of water daily will be injected in each of the four inputs at a maximum pressure of 500 psi.

The FPC felt obligated—in the public interest—to chop away at the prices Transwestern and the producers had agreed upon because FPC considered the prices a mite too high for the fields involved in this particular application.

This certainly appears that the FPC was looking after the welfare of the eventual consumers. However, suppose Transwestern had originally gone to Louisiana and lined up a supply of offshore gas. It would have paid more, of course, because costs there are greater and the established field prices are higher.

Also, since the Louisiana offshore is some 900 miles farther from California than the West Texas fields, the added expense of a longer pipeline would have been involved.

Yet—and here is the irony of the situation—if Transwestern had purchased Louisiana offshore gas and proved that it was paying no more than the going price in that area, the FPC presumably would have been obliged to approve the certificates for Transwestern and the producers.

It is difficult to see how this would work to the benefit of the California consumers, since the Louisiana gas would cost them perhaps as much as 10 to 15 cents more per M.c.f. than some of the West Texas gas.

Gulf Oil Corp. used this line of reasoning in urging the commission to reconsider its price-trimming action in the Transwestern case.

Next year will be an election year, so . . .

ONE REASON WHY the State Department wants residual fuel oil imports quotas lifted: It doesn't want the Government to get the blame if domestic shortages crop up this winter or if prices should climb.

It is urging the Interior Department to adopt a more flexible plan which would largely leave to the companies the responsibility for adequate supplies—and the blame for any price hikes.

Sponsors wanted for bomb test in shale . . .

SOME PROGRESS is being made in the planning for a nuclear test explosion in oil-shale deposits.

The Bureau of Mines hopes to be ready by the end of this month to begin contract negotiations with oil companies that have indicated a willingness to participate in at least the first phase of the experiment.

This first phase would include the explosion itself and preliminary studies to determine how well rock formations were shattered and other conditions were after the blast.

The bureau hopes to line up several firms—perhaps a dozen—to put up a total of $500,000 as the industry's share of the cost of the first phase.

The second phase, which would cost an estimated $750,000, would delve into the details and help determine if recovery through use of nuclear explosion is feasible.

Where Credit-Card Buying Is Headed

• Random mailing of credit cards, plus easy treatment of deadbeats, has pushed credit costs to three times what they were 10 years ago. Marketers are anxiously studying the problem, but the ideal solution isn't in sight.

MERLE BLAKELY
District Editor

TOP MEN in the nation's marketing companies are taking a long, hard look at their multimillion-dollar credit business in gasoline and other service-station products.

The reason: Costs of handling credit accounts have trebled in 10 years and threaten to go still higher.

Bad debts, slow collections, and the expense of unused accounts, in addition to inflation, have made credit costs soar. They've jumped the average cost of setting up and handling an account from a range of $11 to $19 a year in 1949 to a range between $30 and $59 today.

"Our gross revenues and our sales are climbing," an officer of one large marketing company said last week. "At the same time, the costs of adminstering these credit accounts are breaking our back."

But there's no big rush to reverse the trend for one good reason: Credit accounts at the filling station, like Santa Claus in a department store, are pulling in the business. And the national habit of buying on credit is getting stronger. No marketer, whose pressing job now is to get rid of his company's products, is eager to get tough with his customers or fail to bring in all the new ones he can.

So, for the moment, most oil companies are continuing to flood the nation with credit cards while bemoaning the high cost of doing business and wishing for a solution.

But many are openly worried about the trends and are talking about new approaches to the credit business, and some are actively working on new ways to handle it.

1. Two Plans

Drawing most attention at the moment are two ideas:

. . . A central agency which would handle the paper work and collections for a large number of oil companies.

This would cut costs by eliminating duplication of credit offices in the individual companies. It would also remove a worrisome non-oil function from the oil companies' operations.

. . . A "universal" credit card sponsored by a few cooperating oil companies. This would give motorists nation-wide credit, give each company additional prospective business, and likewise cut costs by reducing duplication of effort.

Central billing . . . The suggestion that companies abandon a big chunk of their billing and collection overhead and farm it out to an independent agency is gaining converts.

Nothing has been done to set it in motion, but here's how its advocates think it should work:

The agency would receive, tabulate, and collect all bills for all marketers wanting the service. There could be a flat service fee. The agency, operating entirely outside company setups, would ride herd on slow pays and deadbeats.

Companies would continue to issue credit cards, investigate risks, cancel privileges. A sliding-scale pattern to determine how the agency and the participating oil companies would absorb losses has been talked.

Advocates believe a single, expertly run agency would speed remittances and reduce the gap between purchase and payment. The average time lag has increased from about 39 days in 1949 to 52 to 60 days at present.

They also believe big savings are possible. Companies now employ large staffs to handle accounting, mailing, receiving, and filing work. Because collection services basically are unrelated to product name and quality, champions of central billing feel a company would not be sacrificing benefits of brand identification in sales.

One big fear of front-line marketing people is that such an agency would get too tough with clients.

They doubt the wisdom of relinquishing a contact with consumers, even at billing and collection levels.

The specter of losing a customer, by actions of an agency removed from company direction and control, is a paramount consideration. These marketers reason: Why cultivate, and at times even pamper, a buyer and then take chances on alienating him?

Others aren't convinced there would be sizable money saving, or enough to justify the change.

Universal credit card? . . . A few companies are tiptoeing quietly in the general direction of a universal oil credit card.

At least two major marketers have indicated a willingness to initiate such a plan. However, four or five companies are considered the minimum necessary before this type plan might be given a fair trial.

Such a program, in which companies would honor a special card at all stations of participating companies, would go the central billing office one better. It would put all cost of handling credit business—from issuing cards to billing and collections—in this outside agency.

Companies then could devote more time and more money in pushing sales and in mechandising brand products. They would save up to 60% of their present card-issuing and credit-card handling costs, some believe.

The two companies proposing this plan are regional marketers. If they are joined by two other regional marketers whose areas don't overlap, each then could pick up thousands of traveling customers from outside its own operating area.

Bigger companies with more widespread marketing would have less incentive to join such a program.

While the central billing agency has advocates, but no promoter, the universal credit card could come into being at any time. The two companies involved are currently looking for partners.

New Gadgets Promise to Trim Costs

NEW EQUIPMENT just introduced is expected to cut costs and reduce errors in credit card account handling.

The charge ticket, with handwritten gallonage and cost figures, may be on the way out.

New cash register-type imprinters reproduce the customers name and number from the credit card. And in addition, the station attendant punches the total cost of purchase. Humble Oil & Refining Co. and Standard Oil Co. of Ohio reportedly are buying the new imprinters.

The invoice copy, when fed to machines in the central billing office, translates the information to the proper account and keeps a running total for individual, periodic billing. This eliminates a present step—which requires employes to read the handwritten charge figures and convert them into coded cards for tabulation.

The machines will process 180 invoices a minute. The equipment has been developed by Addressograph-Multigraph Corp.

2. The Credit Problem

The number of credit cards in the oil business has soared to an estimated 46,000,000 to 50,000,000. Most companies are noncommittal about the number in force.

About 110 companies market oil products in the United States and 80% of these do business on their own credit cards. At least 12 are known to have more than 1,000,000 of their cards in circulation. The number in this select list is growing.

To place a credit card in force costs from $1.89 to $5 before a nickel's worth of product is sold.

This figure takes on staggering proportions since fewer than one-half the cards issued are used, except infrequently.

Standard Oil Co. of California, which keeps its cards active by reissuance at frequent intervals, has a high percentage of active accounts. It "purges" its inactive lists regularly.

However, some of the top marketers experience an active ratio on cards from 23 to 35%. They also estimate that the "average motorist" has from three to seven cards at his command.

If a company has 1,700,000 cards in force, chances are not over 700,000 are used regularly. If $2 is an average cost of setting up the account, the company has invested $2,000,000 on which there is no return.

"Credit business is increasing about 18% a year now, while gasoline demand is increasing in the neighborhood of 3 to 5%," the financial vice president of one company said.

"So it appears we're being foolish. We are converting a lot of people from cash to the less-profitable credit business."

Another company is thinking of bucking the trend. It has asked an opinion of its legal department on possibility of offering gasoline to cash customers at 1 cent a gallon less than the posted price.

Many companies suffer substantial losses on state and federal gasoline taxes, which they pay on accounts which are not collectible and eventually are charged off. This tax payment represents an outright cash loss, over and above the product loss.

The inactives . . . Wooing inactive accounts back into the fold is a difficult and expensive chore. And the results are questionable.

Some companies call accounts inactive after 6 months of nonuse, others after a year.

Some use the affirmative approach to get buyers back. They send letters urging them to buy and telling them their card will remain in force. Others purge their card lists with the negative approach. They advise the customer his card will be cancelled if he does not apply for renewal.

Both methods soak up postage, secretarial, and clerical budgets.

Giveaways are another costly bait to reactivate idle cards.

Skelly Oil Co. recently offered a 56-page road atlas to 36,100 inactive Skelly card holders. Customers must visit a Skelly station and sign a card. How much the idle cards will be revitalized is yet to be learned.

Cash coupons failed to produce

NEWEST TRICK in credit-card buying is being tried by Continental on Oklahoma's Will Rogers turnpike. Instead of selling gas on a restaurant card, Conoco offers meals on its gasoline card. Motorists have plenty of time to think it over. More than 20 miles from the station they're faced with a big sign reading: "Eat on your Conoco credit card."

for another company, which sent them to 350 residents in one city. The letter enclosed a slip good for $1 in products at any company station. The letter was followed by a phone call or personal visit.

After 4 months only 30 slips had been cashed.

Low standards . . . One of the biggest factors in rising costs is the drop in credit standards.

Says the treasurer of one company: "There seems to be a competition among oil companies to see which company will go furthest in taking on marginal or submarginal risks."

One outstanding case is cited: Dealers in one southwestern city recently sent a list of 1,960 names to their home office asking that credit cards be issued. The credit department made a check and found:

. . . That 96 of the people had died or moved without leaving a forwarding address.

. . . That more than 600 already had company cards.

. . . That about 200 didn't own automobiles or equipment which used oil products.

Later it was found that the list was 10 years old and had not been updated.

Too often, though, a thorough check isn't made. Hundreds of thousands of cards have been mailed to names on a mailing list or dropped at front doors in residential areas.

"The matter is getting out of hand," says a 22-year marketing veteran. "One of these days it will blow up in our faces unless something is done."

3. What Some Are Doing

The warning flags being raised in the industry are being heeded by some companies.

Some billing and collection branch offices are being consolidated to cut costs.

Standard Oil Co. (Ind.), for example, now handles all billing and collecting from one office. Three years ago it had 23 offices.

Another major soon may close three branch offices and concentrate all work in one headquarters. About 100 fewer employes will be needed, and there will be other savings in bookkeeping, accounting, and filing costs.

A few marketers, including Deep Rock, Champlin, and Anderson-Prichard, now levy a 6% charge on dealers for handling credit purchases on cards other than their own. Some estimate that 10 to 15% of their business is on "foreign" cards.

Texaco imposes a delinquency charge on some TBA accounts more than 90 days old. Continental has contacted some of its dealers on the possibility of instituting a delinquency charge experimentally.

Some companies are enforcing a rule that no tires, batteries or accessories can be sold on credit unless they are installed. This is designed to cut down on the "nuisance" buyers who pick up a set of tires, sell them a few blocks away, and have 30 to 90 days' free use of the cash.

Permanent long-term credit cards, revokable only for cause, are coming more and more into vogue. This cuts cost of reissuing periodically or changing them when customers move. On these cards, street address and home city are eliminated. A code number is substituted. An added advantage is that it discourages acceptance at stations other than those of the issuing company.

But most marketing officials feel these steps, while good, fall far short of what is needed—something to stem or reverse the rising tide of expense of doing business on credit.

4. Outsiders' Heyday

The "outsiders" have entered the oil-credit business this year as never before.

The Hilton "Carte Blanche" card automatically offers 1,000,000 possible new customers to its sponsoring companies. Hilton runs the credit check, charges $6 a head, stands the risk of losses. "Nominal" fees from 4% up are charged for handling.

The card now is honored at 32,000 Mobil, General Petroleum, and Magnolia stations in 43 states, at 10,000 Tidewater stations, 600 Shamrock Oil & Gas stations in the Southwest and Rocky Mountain area, 4,500 Union Oil of California outlets in 10 western states, and 8,000 Continental Oil Co. stations in 27 states.

For a company like Mobil, tying in with Hilton just about doubles its

customer purchasing potential, even accounting for duplications. The Hilton program was launched last November and Mobil stations have been accepting the cards since April 1. Continental began honoring the cards September 1.

More than 2,000 California service stations are members of the Bank of America charge account plan. The bank has issued 1,500,000 Bankamericard credit tickets and by October 1, they will be good for use anywhere in California. At present, they are honored in the interior valley of California, in six bay area counties around San Francisco and in the greater metropolitan area of Los Angeles.

The Diners Club, with its 1¼ million card-carrying members, urges purchase of products at Petrofina stations in the Midwest from Texas to Minnesota, Frontier Refining Co. stations in 12 states of the West and Middle West, British Petroleum in Canada, and Cities Service Oil Co. stations in Ontario and Quebec.

The American Express credit organization which entered the comprehensive card field in 1958, reports 600,000 card holders. The Chase Manhattan Bank of New York City and the Citizens and Southern Bank of Atlanta have inviting credit-card setups which offer a broad oil-marketing potential.

More than 200 banks in the U. S. have credit plans which permit buying of oil, gas, and other items on signature. The plans are growing in number.

Speaking of charge-account banking, which has had its biggest impetus in history in the last 3 years, the vice president of a large bank said recently:

"Within 10 years, most of the retail credit business in the country will be done in this manner."

This strikes home as oil companies are pioneers in the credit-card field. They probably have more credit accounts than any other industry.

A new entrant in the credit-card race is Seaboard Finance Co., which has 550 offices in the United States, Canada, Alaska, and Hawaii.

Its International Charge, Inc., organization won't be in full operation until October. But crews of salesmen now are enlisting merchants and service-station operators in metropolitan centers to participate. Sales by service-station operators in California, on the new finance-company card, began August 24. The card is issued free and there is no charge to the purchaser, unless he takes more than 30 days to pay his account. Then a graduated scale of charges becomes effective.

The race to grasp a chunk of the oil and gasoline credit market gained tremendous momentum during early months of 1959. It has not subsided.

Endorsement by oil companies of these hotel, restaurant and other "outsider" cards is seen as a step toward the universal credit card. But they have another value in the meantime. They'll give the oil companies an outside check against their own credit costs.

5. Where Next?

At the moment there's no openly advocated solution to the credit-cost problem.

Oil-product sales on credit are booming, and the competition for credit customers is rugged. But costs for collecting on the sales are eating sharply into profits.

A major-company jobber of 42 years' experience says: "No other business would operate like this and expect to last."

He belittles the fears some marketers have of forcing buyers to pay up or be crossed off the credit list. He favors severe credit checks and harsher collection tactics. He's critical of the Milquetoast attitude prevalent in handling credit accounts.

Marketers with his viewpoint are still in a minority, but if the problem gets worse, the pressure for a change will increase.

No sales manager wants to dump the millions of credit customers, who buy 3 gal. of gasoline more and spend about $1 per call more than the average cash customer at the service station. But it's a simple fact that these credit customers are getting more expensive by the month and the problem will soon demand a solution.

That's why the talk of central billing and cooperative "universal" cards is growing. And if a few companies figure they can save money without jeopardizing their brand-name sales, the industry may soon see some new schemes for handling credit.

PROCESSING BRIEFS . . .

A 20 million pounds-a-year unit for producing AviSun polypropylene has gone on stream at the Koppers Co. Inc. plant in Port Reading, N. J. The new unit is operated by Koppers personnel under technical direction of AviSun Corp., which is leasing the facilities from Koppers. Avi-Sun is an equally-owned affiliate of American Viscose Corp. and Sun Oil Co., formed earlier this year to manufacture and market polypropylene polymer, film, and fiber.

A new laboratory group, the Long Range Plastics Application laboratory, will be set up by Dow Chemical Co. at its Midland, Mich., headquarters. The laboratory, to be headed by Douglas S. Chisholm, will tackle long-range application problems for plastics.

Executive offices of Texas Butadiene & Chemical Corp. have been moved from Houston to 529 Fifth Avenue, New York. John D. Fennebresque, president, and several other top officers will headquarter at the new offices. The company will continue to maintain an office at Houston. It is the headquarters of Homer C. Wilson, vice president of operations.

Centralization of most of Monsanto Chemical's research activities is planned with the development of a research center at the company's general offices location in Creve Coeur near St. Louis, Mo. Initial phase of the project calls for construction of a building complex consisting of two laboratories and supporting facilities for the inorganic chemicals, organic chemicals, research and engineering, plastics, and Lion Oil Co. divisions. Completion is scheduled in 1961. Many of the 400 employes involved in the first part of the program will be transferred to the center in about 2 years from Dayton, Ohio, and El Dorado, Ark.

Also for Refiners . . .

IN THE NEWS: One-cent increase voted in gasoline tax (p. 59) . . . Court suits and stalled bargaining sessions mark major refinery strikes (p. 59) . . . Marketers are anxiously studying the problem of high costs of credit-card buying (p. 62) . . . Distance between oil changes is growing longer, API reports (p. 74) . . . Increase in product prices bolsters Peruvian oil industry (p. 82).

PLUS THESE TECHNICAL REPORTS: Catalytic desulfurization of cat cracker feed stock (p. 88) . . . California Standard improves maintenance-data handling (p. 111) . . . Pressure-enthalpy diagram for JP-4 fuel (p. 112).

Rayne Field: New Gas-Buying Pattern?

- Instead of contracting for Rayne field gas, Texas Eastern just bought the properties. It's the first deal of its kind, but more are in the works.

Texas Eastern sees these advantages in its Rayne field purchase:

- It sets a fixed price for all production by eliminating price escalations and indeterminate price increases.
- The cost of the gas is less than proposed in an earlier gas purchase contract.
- The company gains control over the rate of production.
- The purchase eliminates take-or-pay provisions of a gas purchase contract.
- It assures the company no favored nation or price redetermination clauses in its existing contracts will be triggered.
- It increases the company's gas reserves by 1 trillion cubic feet.

TEXAS EASTERN Transmission Corp. is showing the natural-gas industry a new way to do business.

At Rayne field, South Louisiana, Texas Eastern has set a pattern that may be followed by others in moving gas from the reservoir to the utility consumer at the far end of the pipeline.

In contrast to the use of the normal gas purchase contract, long the standard for the industry, Texas Eastern has acquired Rayne field's leasehold producing interests outright. Thus, the big transmission company becomes the producer as well as the pipeliner for a gas field with a trillion cubic feet of reserves.

Such a project has several basic advantages and, in this case at least, has brought satisfaction to all parties involved—the royalty owner, the producer, the pipeliner, and the Federal Power Commission.

The FPC's order approving the deal is important to this and future projects. The agency did not approve a specific rate for the gas but ruled on the propriety of the entire transaction. This eliminated the time-consuming rate battle that has plagued other applications under standard gas purchase contracts.

The arrangement pleases the royalty owner because he will start getting his payments quicker and is guaranteed a "fair market value" for the gas.

The producer is happy because he gets a cash payment, plus regular payments on a 16-year note for the remainder of the sale price.

President Orville S. Carpenter of Texas Eastern explains that the company has been "working steadily for a number of years to develop a reasonable and stable purchasing arrangement that would reduce the pricing problems that have developed within the gas industry.

"We feel the Rayne field purchase affords a major step in this direction."

Its history . . . When Texas Eastern decided originally to bid for Rayne field's reserves, it applied to the FPC under the conventional purchase contract and proposed an initial price of 22.6 cents per M.c.f. plus 1.3 cents for taxes.

The proposal contained an escalation clause of 4 mills yearly to a top of 30.2 cents in the eighteenth year. The average price for the 20 years of the contract would have been 26.6 cents.

The payments would have gone to the four producers in the field—Continental Oil Co., General Crude Oil Co., M. H. Marr of Dallas, and Sun Oil Co.

This contract proposal won the approval of an FPC examiner in April of 1958.

Meanwhile, however, the leasehold purchase plan evolved and Texas Eastern filed a petition with FPC to reopen the hearing and approve the new type of contract.

Under the new plan, which FPC approved in late June, Texas Eastern paid $12,420,500 in cash in July and will pay $121,975,200 in noninterest-bearing notes over 16 years.

The New York Public Service Commission, which usually opposes all gas-purchase plans affecting the State of New York, filed a motion with the FPC asking a rehearing of the case. The FPC denied the motion.

The New York agency now has the privilege of carrying an appeal within 60 days to a federal circuit court of appeals but has not indicated it will do so. Texas Eastern officials are confident the FPC ruling will withstand any attack in court.

How it helps . . . Texas Eastern, a postwar transmission giant, is delighted with the Rayne field contract.

It gets the gas at an estimated 20.59 cents per M.c.f. which is 2.01 cents less than the initial price of the original contract. The 20.59-cent figure is computed by figuring the reserves against Texas Eastern's purchase price, including a rate of return on investment.

The royalty owner, on the other hand, will receive payments at the rate of 22.60 cents, the original producer's price.

Texas Eastern, under the plan, is spared price variations in the future. The FPC made this clear in its ruling.

"The price Texas Eastern will pay for the Rayne field leases is fixed for all production from the field and is not subject to the annual price escalations and indeterminate price increases provided for in the gas-purchase contracts," the FPC said.

Complete control over production at Rayne will give Texas Eastern far greater flexibility in meeting seasonal demands for gas and in complying with minimum take-or-pay provisions in its other gas purchase contracts. Under "take-or-pay" the transmission company must take certain amounts of gas or pay for the gas.

Also by controlling Rayne's production, Texas Eastern can take advantage of "spot" purchase of gas in

ROYALTY owners eat barbecue under big tent at the field and hear royalty checks will be mailed soon.

other fields when rates are attractive.

There is no question that the Rayne plan meets with the approval of the royalty owners in the field. More than 700 of them, plus their families, happily attended a barbecue recently under a huge tent at the field and shook hands with their new partners, top officials of Texas Eastern.

The field . . . Continental brought in the first gas-condensate discovery at Rayne field on July 12, 1954, with its Petitjean 2.

Since that time the field has grown to 18 producers and covers about 4,800 acres. Texas Eastern is now conducting productivity tests before deciding whether additional wells are needed.

The rich area has seven pay sands, and it is entirely possible that the estimate of 1 trillion cubic feet of gas reserves is too low.

The field is located about 25 miles west of Lafayette and 3 miles northeast of Rayne.

Facilities . . . Texas Eastern has just completed a 22-mile 14-in. line to the field, connecting it with the company's main-line system to the north at Opelousas.

A new separation facility is processing a little over 100 million cubic feet of gas daily and sending the residue gas into the main line.

Approximately 200,200 gal. daily of hydrocarbons are taken from the gas for consignment to Continental and Sun.

Texas Eastern is preparing for rapid expansion. Construction already is started on a $4-million gas-processing plant adjacent to the present smaller plant. When completed next May, it will be equipped to process at least 176 million cubic feet of residue gas daily.

The plant will recover approximately 200,000 gal. daily of mixed propane, butane, and pentane, plus another 400,000 gal. daily of stabilized distillate. It will contain full absorption, distillation, and separation units.

The liquid products then will go by pipeline to the Acadia Pipeline Co. plant at Egan, La., under a contract to Sun and to Continental's refinery at Lake Charles.

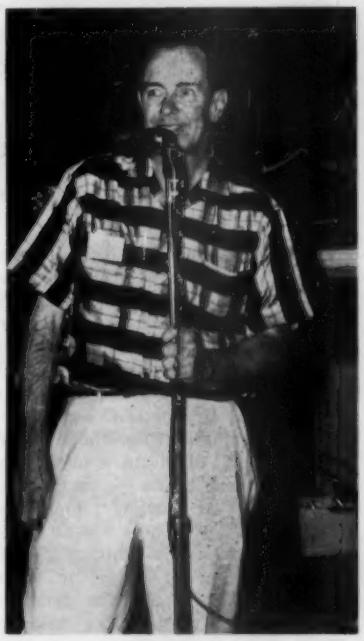
More to come? . . . Texas Eastern freely admits it is looking over other "Rayne" deals. And so are other big transmission companies of the Southwest.

Not all gas fields lend themselves to the leasehold purchase type of arrangement. First, of course, only fields which are not already tied up in long-term purchase contracts are eligible.

New fields which have a large number of operators would be difficult to bring under such a program because of the difficulty of obtaining agreement on a contract.

The field with big reserves, few owners, and in the vicinity of a main-line pipeline is the best bet. These characteristics point directly to offshore Louisiana, and it is here that some of the present negotiations are taking place.

There may be a pattern developing, with Rayne as the prototype, and it may serve to hasten the movement of natural gas from reservoir to consumer.



GIVING royalty owners a rundown on new setup is John G. Lynch, Texas Eastern senior vice president.

As Texas Eastern's president explains it: "All things considered, the leasehold purchase is extremely beneficial to every segment of the gas industry — the producer, consumer, transporter, and distributor. The price stability afforded makes this method of acquiring reserves a most attractive one to all of us."

Fifth Dome Flows Oil

. . . as a Dallas independent reduces the number of East Texas' unproductive piercement-type salt domes to 13.

ANOTHER of East Texas' famed "barren" salt domes surrendered last week and produced its first oil.

A Dallas independent operator, Whiffen Estate, Inc., found commercial oil in the Woodbine on the west flank of the Butler dome in extreme southeastern Freestone County.

On a preliminary gage, the discovery flowed 8 bbl. of oil an hour through ¼-in. choke from casing perforations at 4,708-20 ft. Flowing tubing pressure was 175 psi. There was no water.

The discovery is Whiffen Estate's 1 Daniel Memorial Orphanage, Simon Sanchez Survey, A-30. It is about 2½ miles southeast of Butler townsite. Drill site is on an 821-acre farmout from Texaco, Inc., major leaseholder around the dome and one of the most active and successful of East Texas salt-dome explorers.

No. 5 . . . The Butler dome becomes the fifth in East Texas to be brought into the productive column, and the fourth in the past 3 years.

Exploration on the region's 18 piercement domes picked up sharply after Texaco and British American Oil Producing Co. scored almost simultaneously in June 1956 on the Bethel dome in Anderson County and the Hainesville dome in Wood County, respectively.

The discoveries turned out to be relatively small, however, and since the initial spurt, East Texas domal exploration has been sporadic.

Texaco scored again in March 1958 when it opened Woodbine production on the Oakwood dome, also in Freestone County and only about 10 miles southwest of the Whiffen strike.

Prior to the past 3 years, only two of the domes had produced—and one of these for only a short time. These two were Boggy Creek and Concord—the latter long abandoned.

As a whole, they have posed an enigma for oil finders since 1891 when E. T. Dumble first described six of them from surface observation.

Humble Oil & Refining Co.'s strike at Boggy Creek in 1927 triggered an intense salt dome play all over East Texas. Some shows were found, but no commercial fields.

Recent exploration has shown why the luck of the dome wildcatters has been so poor. Flank structure on the domes has proved treacherous and much more complex than was previously supposed.

British American, for instance, still has only a one-well reservoir on the Hainesville dome despite close offset drilling. And the producing interval, initially believed to be the Woodbine, now is thought to be the Travis Peak.

Exacting geophysics . . . The four strikes on East Texas domes in the last 3 years must be credited to extremely precise geophysical work.

The treacherous nature of inland domes is again evident in the Butler find.

Whiffen's discovery was drilled just 75 ft. to the east of a dry hole drilled a few months back by W. C. Perryman, Athens, Tex., which found only a show of oil in a Woodbine section not even present in the 1 Daniel Memorial Orphanage.

Furthermore, though very close to the Perryman duster, the Whiffen strike ran 302 ft. higher.

Operator estimates the hole is about 200 to 300 ft. west of the salt plug. It did not penetrate a salt overhang. The Woodbine interval proved productive and was topped at 4,708 ft., and the bit went out of it and into shale at 4,720 ft. Total depth was 4,791 ft. in shale.

R. A. Graddy, general manager for Whiffen, told the Journal last week that prospects appear good for deeper pay but that drilling was halted for fear of losing the hole.

Drilling of the bottom 400 ft. of the hole was unusually tough due to formation dip of more than 70° from vertical.

Plans are to take the next test on the dome considerably deeper.

LPG Injections Started

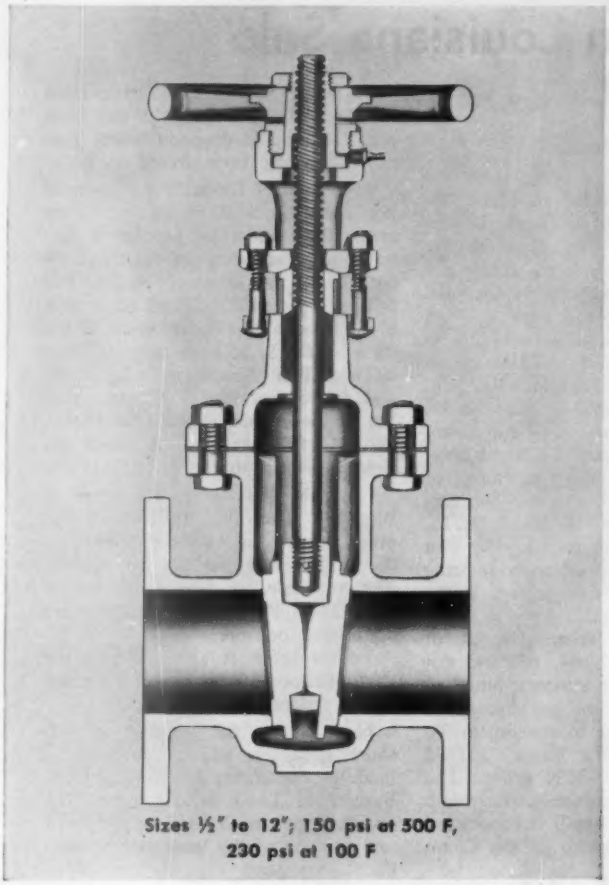
TEXACO, INC., has started injecting an LPG slug for a new miscible oil-recovery program in Mabee field, West Texas.

The reservoir, which produces at 4,638 to 4,736 ft., is wholly operated by Texaco, and there is only a single royalty owner. The company currently is injecting about 1,500 bbl. of LPG daily into the pay through its 189 J. E. Mabee well, a converted producer.

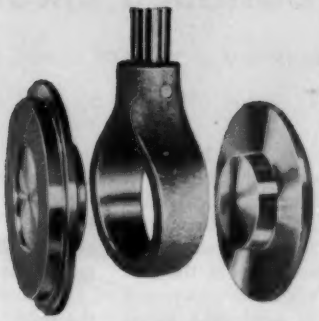
Plans are to inject a total of about 104,000 bbls. of LPG and follow this with natural gas.

The reservoir, in Andrews and Martin counties, is a solution-gas-drive type pool discovered in January 1944. Original bottom-hole pressure of 1,905 psi. now has declined to about 650 psi.

Texaco has been injecting LPG under a temporary permit from the Texas Railroad Commission. It sought a regular permit to conduct the project at a hearing before the commission last week.

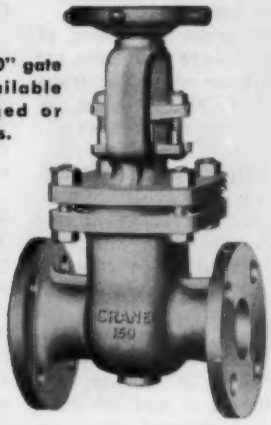


Sizes ½" to 12"; 150 psi at 500 F, 230 psi at 100 F



Crane split-wedge disc design. Identical disc halves assure uniform seating pressure.

"Craneloy 20" gate valve. Available with flanged or screwed ends.



Exclusive design for lasting tight seating in "Craneloy 20" gate valves

The simple, unique split-wedge disc construction in "Craneloy 20" gate valves is the key to smooth operation, tight shutoff and long seat life.

Identical disc halves, exclusive with Crane, mean that seating loads are transmitted equally to each half, assuring uniform pressure on the seating faces. No danger of buckling—there's no weak disc member as in conventional ball and socket disc construction. In opening, the first turn of the handwheel frees discs—even if the valve is closed hot and opened cold.

Special guide flanges on the discs, *another Crane extra*, prevent disc drag across the seat during operation . . . give you longer seat life. Discs are free to rotate to prevent seizing and galling.

All parts of the valve in contact with flow are "Craneloy 20," a high nickel, high chromium stainless steel cast in Crane's own foundries. Stuffing boxes are packed with tough, resilient, non-contaminating Teflon.

For complete information about all Crane stainless steel valves, see your Crane Representative.

Get complete specifications on "Craneloy 20" stainless steel valves. Ask your Crane Representative for Circular AD-2080, or write to address below.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Illinois—Branches and Wholesalers Serving All Areas

Lower Bonuses Likely in Louisiana Sale

- Most tracts are in wildcat areas, some with dry holes.

Of 200,000 acres offered, 62,500 are in gulf.

WHEN THE State of Louisiana holds its lease sale this Thursday, it can't expect to collect as much bonus money from offshore acreage as it received in last February's state sale.

The 23 offshore tracts in the sale are generally in wildcat territory, and a number of them have been leased before and contain dry holes.

Some, however, are considered choice exploratory tracts and could command high bonus bids.

The sale comprises 191 tracts, of which 23 are offshore and seven are in the White Lake area. The tracts total more than 200,000 acres, of which about 62,500 are offshore.

Some leased before . . . All the offshore tracts are in Zone 1.

Following are the tracts up for leasing and the exploration prospects:

. . . West Cameron area, portions of Blocks 10, 11, 12, 13, and 20: This is wildcat territory, although the Block 45 gas field, developed by John Mecom, lies about 1½ miles to the south of the Block 20 acreage. The acreage in Blocks 9 and 10 have been leased and dropped after two dry holes were drilled in Block 10. The south portion of Block 20, located in Zone 2 and close to the Block 45 field, went for $925 per acre to British-American in the August federal-state lease sale.

Portions of blocks 25 and 26 in the West Cameron area: These are on the north flank of the Block 40 field. The southern portions of these blocks, in Zone 2, went to Phillips and Cabot Carbon for $400 and $225 per acre.

. . . Vermilion area, portions of Blocks 3, 4, 5, 16, 17, and 18: This is wildcat territory. Blocks 4, 5, 16, and 17 were leased formerly by Pan American and dropped without being drilled. Humble leased acreage to the east last February.

. . . Ship Shoal area, portions of Blocks 45, 46, 47, 64, 65, and 66: This also is wildcat territory, although there have been some gas discoveries in the swamp area to the north. To the southwest is the Block 72 field developed by the MCN group. The sale offers some acreage in the swamp area to the north, but it is considered onshore and lies north of the Chapman line.

. . . South Pass area, West portion of Block 22: The acreage has been leased twice and dropped twice. Two dry holes have been drilled on it.

Nearly all of Block 39 and a small portion of Block 38 in the South Pass area: Shell and The California Co. have leased and dropped the Block 39 acreage. It has three dry holes. The 540 acres offered in Block 38 is in a high-priced area. The bulk of Block 38 went for $1,052 per acre to Texaco and Pan American last month, and portions of Blocks 27 and 28 to the northeast went to Shell for $4,931 and $10,442 per acre. A small gas field lies just to the north of Block 39.

. . . Main Pass area, 65 acres of Block 45: The bulk of Block 45 and other nearby blocks were offered in the August sale but got no bidders. The new sale contains a number of other Main Pass tracts, but these are considered onshore.

Following Thursday's lease sale, the next offshore offerings will be made by the federal Government.

Nominations for acreage in offshore Louisiana and Texas must be made by September 25 with the U. S. Bureau of Land Management. The nominations are limited to Zones 3 and 4. Date of the lease sale has not been announced.

Oil Stands to Gain From Moho Project

A DEEP-DRILLING experiment—aimed at piercing the earth's crust—can be done within 4 years, a committee of the National Academy of Sciences and the National Research Council believes.

One of the byproducts of such a scientific project, the committee said in a report issued last week, may be highly useful information for the petroleum industry.

"This experimental work may very well lead to faster, better, and cheaper techniques for deep drilling, coring, and working with drilling ships," the committee said. "Also, it may provide new information about the origin and extent of petroleum deposits."

Already, Global Marine Exploration Co. is preparing a report for the committee on the possibilities of adapting CUSS I to deep water drilling operations. (CUSS I has been used extensively to drill in the Pacific off the California coast.)

Also, two searches are under way to locate possible drilling sites. The aim is to find areas where the earth's "skin" is thinnest so that drilling depths will not be beyond possible reach.

One search is being made north of Puerto Rico and the other in an area off the Pacific coast of Mexico between Guadalupe and the Clipperton Islands.

Two phases . . . The first phase of the project will be test drilling of holes of less than 18,000 ft. from the ocean surface, using modified available equipment.

The second phase, if it is undertaken, will involve construction of a special drilling ship and the drilling of one or more holes of much greater depth—perhaps to as much as 30,000 ft.

The objective of the second phase will be to reach the "Moho," a transitional boundary which scientists believe exists between the earth's outer crust and the adjoining mantle covering the hot, viscous interior of the earth's core.

The committee said three types of drilling are being considered: Rotary, turbo, and soundrill. It also hopes to make use of various other equipment and techniques, including aluminum drill pipe, seawater circulation, automated pipe handling, over-the-side pipe racking, diamond bits, and wireline corers.

One possibility, the committee said, is that sections of pipe several thousand feet long can be racked without disassembly by hanging them over the side of the ship.

The committee said the first phase drilling should help supply answers to such questions as to whether sea water is an acceptable drilling fluid, how much of the hole has to be cased, how much surface movement of the drilling ship can be permitted, and how far the bit will go before becoming dull.

If the right answers to these and other questions are obtained—and if the necessary money is then available—the first major test hole would be drilled. After that, drilling to reach the mantle would be undertaken.

"Ask the man who runs one"

The man who runs the rig knows there's nothing better than the Hardy-Griffin Joint on Atlas Tubing

THE PIPE TO BUY IS

ATLAS PIPE INC.

511 First City National Bank Bldg., Phone CApitol 3-4314, Houston 2, Texas • Houston Plant: 7707 Wallisville Road • Phone ORchard 2-1704 • Corpus Christi Plant: P. O. Box 2368 • Hwy. 44 • Phone: TUlip 4-6371 • Tulsa: 2104 South Detroit, Phone: Diamond 3-6791

HARDY-GRIFFIN
ENGINEERING CORPORATION
A Division of Atlas Pipe Inc.

14522 South Main Street • Houston 25, Texas
Phone: GYpsy 9-9250
Odessa, Texas — Phone: EMerson 6-8241
Oklahoma City, Okla. — Phone: CEntral 2-6665
New Iberia, La. — Phone: EMerson 4-9666

Canada's Top Oil-Gas Expert Is Named

IAN N. McKINNON, chairman of Canada's new National Energy Board, is a greying civil servant with a reputation as the nation's top expert on oil and gas regulations.

The Scots-born Calgarian carries a backlog of prestige into his ticklish new post. Presiding over Alberta's Oil and Gas Conservation Board since shortly after the oil boom started at Leduc in 1947, he carried out his duties to the satisfaction of both his government and the industry over which he exercised so much influence.

In many ways McKinnon's 2,000-mile move to Ottawa is merely a case of switching desks.

As chairman of Alberta's oil and gas board, he heard applications for permission to export massive quantities of natural gas from Alberta to the United States. Three key applications from Westcoast Transmission Co. Ltd., Trans-Canada Pipe Lines Ltd., and Alberta & Southern Gas Co. were approved.

Now, as chairman of the energy board, McKinnon will soon be dealing with applications for national permits from the same three companies. In the export of energy sources the permission of both the province of origin and the federal government is necessary.

The arguments may be repetitious for McKinnon, but it was his very familiarity with the issues involved in export that prompted the federal government to appoint him as chairman of the new board.

The 52-year-old expert will serve in Ottawa for 2 years at $20,000 a year. He declined a 7-year appointment because he was reluctant to leave Calgary and his Alberta post. He has been given a leave of absence from his $15,000 a year job as chairman of Alberta's conservation board.

Role of tutor . . . McKinnon is expected unobtrusively to serve as a tutor for his colleagues on the five-man board.

Although all members are considered to be experts on various phases of energy, none of them has the veteran civil servant's first-hand knowledge of the oil and gas industry.

Born in Edinburgh, Scotland, in 1906, McKinnon came to Canada in 1923. He was in the banking brokerage business until 1930 when he joined Alberta's civil service.

He was assigned to the provincial department of lands and mines which was created in 1930 when the natural resources of the province were changed from federal to provincial control. He worked as an accountant in the department, prior to enlisting in the Royal Canadian Air Force as a supply officer in 1940.

After service on the West Coast and at Ottawa, where he was deputy director of aircraft procurement, he went overseas in 1944 with the rank of wing commander. He was made a member of the British Empire for his RCAF services and in January, 1946 returned to civilian life.

He was appointed assistant deputy minister of the department of lands and mines in October and became deputy minister of the newly-created department of mines and minerals in 1949. He resigned this post in 1952 to devote full time to the oil and gas board to which he was appointed chairman in 1948.

The province's rolling oil and gas boom made full time attention to the board imperative. The board regulates all drilling operations in the province and controls production with a view to obtaining the greatest economic recovery of oil and gas from Alberta's reservoirs, thus eliminating waste.

Before deciding any important issues the board holds hearings to give members of the oil and gas industry and other interested parties an opportunity of expressing their views. In his sensitive capacity as chairman, the precise, soft-spoken former accountant, has won a reputation for being an utterly impartial arbiter.

A key figure . . . In his new role McKinnon will be the key figure in three export applications now pending.

They cover a total of 769,000 M.c.f. daily. This is more than Trans-Canada is now taking out of Alberta to feed the rest of the country via the world's longest gas transmission line.

The basic factors at issue will be familiar to the chairman. In Alberta McKinnon weighed the advantages and the need for export against the maintenance of an adequate supply for Alberta's own future. Now he must balance export applications against Canada's overall supply needs.

Fortunately the Borden Energy Commission has already worked out a good many of the answers. In its nation-wide study of Canadian gas reserves and likely market demands, the commission stated that Canada can afford to export some of its gas.

McKinnon, who supplied a good many of the Alberta figures on which the commission based its report, and the board will be guided by earlier findings.

The new board will to a large extent be playing out its role by ear. The bill establishing the National Energy Board did not spell out a rigid formula on which the board would have to base its decisions respecting construction of pipelines, export of energy and tolls and prices.

Trade Minister Gordon Churchill repeatedly told Parliament that great reliance would be placed on the collective wisdom of the board. The reason: The government's lawmakers confronted with a highly complex industry in which two situations are hardly ever the same, decided no formula would cover every case.

For example the board doesn't have to regulate tolls of pipeline companies if it doesn't feel like it. The board, however, is expected to make sure the Canadian public gets a fair deal.

In reviewing prices of gas for ex-

Easy Does It . . .

RIGGERS at the fire-damaged Hancock refinery at Signal Hill, Calif., recently performed the difficult and touchy job of plucking the 65-ton reactor vessel from the middle of a 270-ft. Thermofor cat cracker.

Energy Boss

port, McKinnon and his associates are supposed to satisfy themselves that Canadian consumers aren't subsidizing cheap gas for United States customers.

In making recommendations on applications for certificates to build pipelines, the board is expected to use common sense coupled with technical background in making its decisions.

In between the lines the board is expected to carry out its duties to ensure that promoters do not get returns that are more than "just and reasonable," and to give preference to firms with a Canadian flavor when everything else is equal.

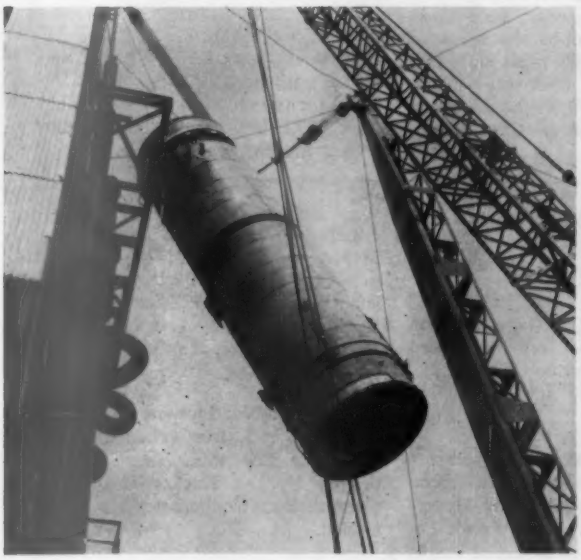
First job . . . The board's first assignments will be in the field of gas.

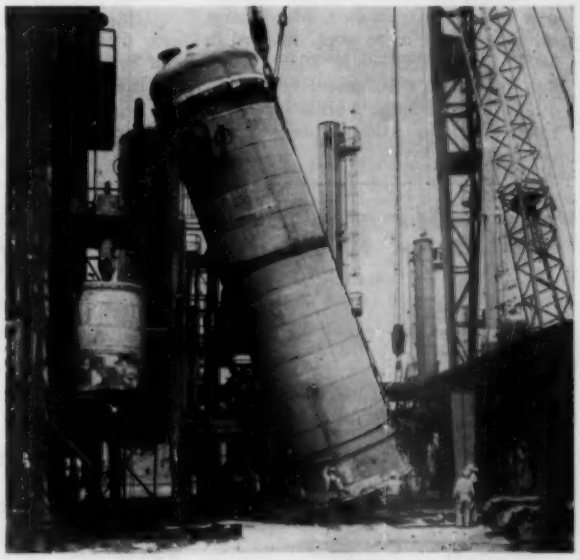
As yet the board has no control of oil imports or exports. It may get this control if international oil companies do not heed warnings implicit in the second Borden commission report. The report recommended that larger markets should be found for Western Canada crude. An 18-month deadline was spelled out.

IAN N. McKINNON . . . Canada's energy chief.

In the meantime the oil and gas industry, which widely welcomed McKinnon's appointment as chairman of the energy board, is hopeful that the federal Government will proceed without delay to get the board fully functioning.

Calgary oil spokesman C. O. Nickle said "his appointment will save at least 6 months in preparing for the hearings." He added "a half billion dollar-capital investment awaits favorable action on the gas export decisions."





and Touchy Job Completed Without a Hitch

The vessel was purchased by Fluor Corp. for installation in a similar TCC unit being built for Shamrock Oil & Gas Corp. at Sunray, Tex. Signal Oil and Gas Co., which bought out Hancock after the fire, is in the midst of revamping and relocating much of the company's refinery operations elsewhere than at Signal Hill. The reactor, 52 ft. long, was eased out of the TCC structure by load blocks attached to the structure and vessel and a 150-ft. gin pole which pulled it away from the tower and lowered it to the ground. The vessel was trucked to a fabricator where it is being modified with new internals, top head, and outlet pipe.

Oil Changes Drop

. . . 20%, API study shows. Interval hits 1,925 miles.

ABOUT 4.5% more motorists take their cars to service stations to be greased or to have oil changed now than in 1955.

These same motorists reported 20% fewer oil changes in 1957 and said the distance between oil changes had lengthened 326 miles to an average of 1,925 miles. The American Petroleum Institute's Division of Marketing has recommended a 2,000-mile oil change (OGJ, June 1, p. 107).

This oil change drop indicates 53 million less gallons of oil were sold, for crankcase changes, in 1957 than in 1955.

The shifting buying habits were revealed in a comparison of national surveys just released by the API.

The findings resulted from a series of questions, designed by the API's marketing division and used in 1955 by a Crowell-Collier Publishing Co. survey and a Look magazine poll taken in 1957. Personal interviews with 9,165 drivers were reported.

The API study shows that fewer motorists change their own oil now than in 1955 as bulk sales to individuals for changes dropped 5%.

The number of new car owners and new owners of used cars, who change oil at 3,000 miles or over, doubled in 1957 over 1955 with 10% favoring the longer-mileage oil change in 1957. Those changing oil in the range from 1,501 to 3,000 miles also increased 40%.

"There was an almost universal trend to less frequent oil changes," the API report stated.

"This trend was found in all categories including motorists classified by income, by age groups, by year model of car, by car bought new or used, by metropolitan center size, and by geographic regions."

Test Gets Big Flow

. . . in rank-wildcat area of the big Anadarko basin.

WHAT IS probably the second most important discovery in Oklahoma's Anadarko basin was brought in last week.

It flowed more than 2,600 bbl. of condensate and 41,000 M.c.f. of gas per day from a deep Cherokee-Pennsylvania sand.

The well is the Sunray Mid-Continent Oil Co. et al. 1 A. O. Baker, about 14 miles southwest of Watonga in Blaine County. Location, in Section 36-14n-13w, is more than 20 miles from production of any kind.

Flow was through open hole at 10,764-10,806 ft. in the Cherokee Des Moines. Distillate flow was 65 bbl. of 53°-gravity liquid per million cubic feet of gas. Flowing tubing pressure was 4,900 psi. in 30 minutes. Casing pressure was 3,700 psi.

This new pool-opener, located in one of the most oil-barren areas of the basin, is about 25 miles southeast of the basin's big discovery of the year, Magnolia 1 Miller, the discovery well of North Custer City-Hunton pool.

Citronelle Sale

. . . to Houston independent is aimed at unitization.

THE SECOND major sale of properties in Alabama's Citronelle field has just been concluded.

Lloyd Smith, Houston independent, paid approximately $4 million for the interest held in 65 wells by Zach Brooks Drilling Co., El Dorado, Ark.

The interest amounts to about 22 or 23 net wells producing approximately 1,300 bbl. daily. The wells are scattered through the field.

A spokesman for the Smith interests said negotiations for the purchase occurred following the death of Zach Brooks last April. Brooks drilled the discovery well at Citronelle, which accounts for five-sixths of Alabama's total production.

Last spring Gulf Oil Corp. sold all its production and facilities in the field to several buyers for $6,750,000. George H. Jett, Shreveport, and Bart B. Chamberlain, Jr., Mobile, acquired 75% of the Gulf holdings, including 48 wells outright and an interest in 21 others.

The new owners, together with Smith and other producers in the field, are pushing for a unitization plan to increase recovery at Citronelle, where primary recovery has failed to meet expectations.

However, production in the field actually hit an all-time high in July. Total for the month was 490,184 bbl., or 52,772 bbl. above the previous record month, March 1958.

INDUSTRY BRIEFS . . .

January is the target date for a nonjury trial in the Government's price conspiracy case against 29 major oil companies. Attorneys for both sides met last week with U. S. Judge Royce H. Savage in Tulsa in a pretrial conference to permit stipulation to noncontroversial issues. Purpose of the conferences is to narrow the area of differences to speed up the actual trial.

An average bonus of $111.84 an acre to the Ute Mountain Tribe and $27.45 an acre to the Southern Ute Tribe were bid for oil and gas leases on 98,435 acres of land owned by the tribes in southwestern Colorado and northwestern New Mexico. Oil companies bid a record $10,359,671 for the leases, which provide a one-sixth royalty. General Petroleum Co. and Phillips Petroleum Co. jointly bid $1,280,285 for a 2,560-acre tract on which one shallow well had been drilled. The California Co. bid $1,234,287, $1,114,000 and $1,050,943 for three tracts of 2,560 acres each.

A 15-cent cut in crude prices for southwest Kansas and the Oklahoma Panhandle has been posted by Mopetco, Inc., a subsidiary of Mohawk Petroleum Co., Tulsa. The reduction to a new top of $2.70 a barrel follows similar cuts made by Derby Refining Co. and National Cooperative Refinery Association.

FPC member John B. Hussey will address the annual meeting of the Louisiana-Arkansas division of the Mid-Continent Oil & Gas Association at New Orleans, September 24-25. Others on the program include E. B. Miller, Jr., Houston, Tidewater vice president; H. W. Patterson, drilling superintendent for Phillips Petroleum, Bartlesville; and Harold Skinner, Houston, director of public affairs for Continental.

An 8,000-bbl. increase to 320,000 bbl. daily in Kansas crude oil allowables for September has been approved by the Kansas Corporation Commission. Condensates are not included.

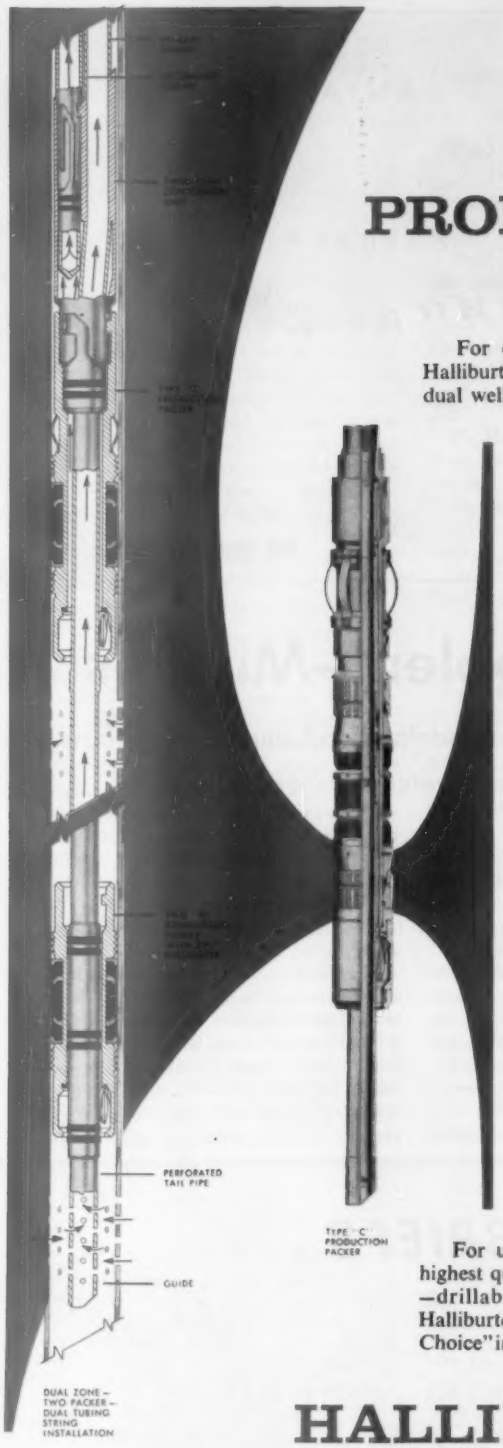
A $310,000 lawsuit was filed last week in Houston against Continental Oil Co. by the widow of Aubrey J. Johnson, drilling crew member who was killed in the explosion and fire on CATC 45-E platform off Louisiana last October. Seven men died in the fire. Johnson was an employe of Nicklos Drilling Co., drilling contractor for CATC.

Where production performance counts...

Get the HALLIBURTON PRODUCTION PACKER

best suited for the job!

For ease of operation and dependable drillability you can select Halliburton Type "C" and "CL" Production Packers for single and dual well completion.



Match the advantages *of Type "C" and "CL" Production Packers to the individual requirements of your well:*

- Drillable material withstands up to 10,000 psi differential pressure—highly resistant to corrosion and harmful fluids.
- The sealing unit and tubing are loose from packer before well treatment begins or well is placed on production.
- Packers permit use of standard tubing as tail pipe.
- Full opening—packer also adaptable for fracturing work.
- Back pressure valve helps to eliminate loading producing formation with mud or water when removing tubing from well or out of packer.
- Packer is suitable for gas or water injection wells—readily adaptable to permanent type completions.
- Retrievable sealing plug dropped on top of packer permits testing—treating and squeezing upper zone... easily retrieved with tubing.
- Expendable sealing plug run on the packer protects lower zone from pressure and fluid when treating above—can be expended by small amount of tubing weight as sealing mandrel enters packer.
- Sealing unit and extra seal elements help provide a tight fluid or gas seal in packer.
- J-Latch Sealing Unit may be used to anchor tubing to packer and place tubing in tension.
- Type "C" Production Packer is run on tubing or drill pipe.
- Type "CL" Production Packer is designed for electrical wire line setting on Halliburton Powder Type Setting Tool.

For unequalled field performance in production packers—only the highest quality can give dependable service. For economy—dependability—drillability—easier operation... plus savings in time and money—Halliburton Type "C" and "CL" Production Packers are still "First Choice" in the field. Write for a copy of the new brochure number S-8027.

HALLIBURTON Cementing Services

284 Service Centers—Just Minutes Away From Your Well

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

Oil Men Face New Problem—Missiles

- Navy wants to restrict use of California tidelands adjoining missile base.

Says industry: Future missile expansion threatens offshore oil search.

WEST COAST oil men are worried that the Government's missile program eventually will crowd out oil exploration in some areas off California—including three offshore tracts which poured $41 million in cash bonuses into state coffers.

That's the reason the industry is opposing Navy plans to prohibit certain activity—including oil operations—in a strip of California tidelands off Santa Barbara County.

The oil men are currently involved in a series of negotiations with Navy officials in an effort to keep the missilemen from closing down the area. This could be done by invoking a 1918 Army Act which permits military services to close off an area to prevent possible injury from target practice.

Both sides in the dispute have some convincing arguments.

The area—30.6 miles long and 3 miles wide—is north of Point Conception and lies offshore from the big missile-firing bases in Camp Cooke Military Reservation which stretches along the California coast.

Industry spokesmen point out that disputed tidelands also include the last known offshore geologic structure in state waters which still is unexplored.

They also are looking down the road. Oil men express fear that future expansion of the missile program might wipe out oil-exploration operations already under way at a loss of millions of dollars to oil companies.

In fighting to keep the disputed tidelands open for multiple use—including oil exploration—the oil industry is joined by other interests, including fishing and recreational organizations.

Navy stand . . . The military wants to severely curtail activities in the disputed zone.

The Navy, which is in charge of the 7,500-mile Pacific Missile Range, cites:

. . . Danger to anyone conducting oil operations in the area. The hazards include possible dumping of highly toxic missile fuel from incomplete firings and flying chunks of prematurely exploded missiles, some weighing several tons and the size of boxcars.

PIPELINE BRIEFS . . .

A major looping program is being completed by Michigan Wisconsin Pipe Line. A 20-mile 16-in. section in Wisconsin, the last phase of the project, will be finished next month by G. E. T. Construction, Inc., contractor for this section. Some 374 miles of 24-in. was laid in the expansion program and 17,880 hp. in compression was installed to increase capacity between Oklahoma and the Great Lakes area.

Alkylate is now being transported through the Great Lakes Pipe Line system. The first tariff was published September 1. The first batch came from Cosden Petroleum Corp.'s Big Spring, Tex., refinery destined for gasoline blending by Northwestern Refining at St. Paul Park, Minn. Alkylate was shipped through Trust Pipe Line to Wichita Falls, Tex., through River Pipe Line to Duncan, Okla., and through Oklahoma Mississippi River Products Line to the Great Lakes connection at Drumright, Okla.

A 38-mile extension to the Wabash Pipe Line products system, which extends from Wood River, Ill., to Griffith, Ind., will be made by November

... **Interference** of metal offshore drilling structures with extremely delicate tracking devices used to follow missiles along the range.

... **Security regulations** which prohibit onshore activity within areas of missile activity. This eliminates any onshore oil-producing facilities.

Oil left out . . . The Navy indicates it would permit limited use of the area, but the restrictions apparently eliminate oil operations.

If oil activity was permitted, floating drilling platforms would have to be evacuated from firing areas on short notice. If permanent drilling structures were used, crews would have to be evacuated for several days at a time. This was indicated in the Navy announcement that missile firings will be stepped up soon from 3 to 20 weekly.

Another major obstacle to oil operations would be the lack of onshore acreage available for production facilities.

Real worry . . . Actually, the oil industry has about written off the area because of the hazards involved.

The industry is protesting the restrictions as a matter of principle and because of the future threat. The real worry is that the missile operations will be expanded in the future, with firings from bases south of the current firing zone.

The military denies plans call for extending the missile range to the south. However, rumors crop up in oil circles that within 7 years missile firings will be under way from the Port Conception region. The Navy could then close off an area from 10 to 20 miles on each side of the launching pad.

Oil men point out such a move would take in Parcels C, D, and E which brought cash bonuses totaling more than $41 million in a California lease sale slightly more than a year ago (OGJ, July 7, 1958, p. 72). The three were among five 3,840-acre tracts put up for bids.

At the time of the sale, Tract D drew a record offshore bid of $23,711,538 by Texaco, Inc., Monterey Oil Co., and Newmont Oil Co. Tract C went to Humble Oil & Refining Co. and Standard Oil of California for a cash bonus of $12,423,598. Tract E brought in $5,100,000 from a combine of Phillips Petroleum Co., Edwin W. Pauley, Kerr-McGee Industries, Inc., and 39 other companies and individuals.

The oil companies already have spent almost $50 million on the three parcels. It's reported that all three tracts have been core drilled with good results. However, none has yet produced oil.

Shutting down operations in the three tracts would be a severe blow to California offshore oil operations.

State affected . . . The State of California also has a big stake in the question.

Under recent legislative action, the state's offshore oil royalties will be used to construct a billion-dollar, statewide, water-distribution system. If the missiles move out the oil men, the state's water development program will also suffer.

TGT Has Kansas Find

TENNESSEE Gas & Oil Co., a division of Tennessee Gas Transmission Co., has brought in a discovery well in Hodgeman County, Kansas.

The wildcat, 4 miles north of Jetmore in west central Kansas, is the 1 Henry Novotny. The find is 2 miles southwest of the nearest production.

On a pumping test, the well made 18.5 bbl. per hour with no water. On a drill-stem test at 4,634-59 ft., it recovered 3,759 ft. of oil, 179 ft. of very heavy oil-cut mud, and no water.

The producing zone is the Mississippian dolomite. Total depth is 4,659 ft.

Utility Ruling Hit

. . . by Jenner in dissent on Richfield gas decision.

COMMISSIONER T. H. Jenner last week filed his dissenting opinion to a California Public Utilities Commission ruling that Richfield Oil Corp.'s gas operations in the state make it subject to PUC control.

In attacking the majority opinion Jenner declared: "Richfield did not dedicate its gas reserves to public use in any of its deals with Southern California Edison Co., Pacific Lighting Gas Supply Co., or Pacific Gas & Electric Co. as contended in the majority decision."

The decision is in conflict with state laws and constitutes taking Richfield's property without due process and violates the company's right of contract under the federal and state constitutions, Jenner said.

He said the decision could easily result in other California operators refusing to do business with gas utilities for fear of being declared utilities themselves. This factor could have "serious detrimental effects" on the gas-using public.

The decision against Richfield resulted from complaints filed involving a gas line Richfield built from San Joaquin Valley to an Edison steam plant. Further hearings are slated October 5.

---

1. Some 29 miles of 12-in. and 9 miles of 16-in. are being laid from Griffith to Lake Calumet in Chicago. Morrison Construction Co. and Contracting & Materials have the construction contracts. Wabash has completed a 1,450-hp. pump station at Griffith.

United Gas Pipeline has completed 24 miles of 8, 10, and 12-in. gas pipeline connecting gas fields in Galveston Bay with the United Gas main system. The line is designed for 84,000,000 cu. ft. daily capacity and will take about 48,000,000 available from fields in the San Leon Point area of Galveston Bay. The gathering system ties in with United's 20-in. Houston-Orange line east of Channelview. It consists of 14½ miles of 10-in. line and 0.6 mile of 8-in. in the bay and 8.6 miles on land.

Purchase of Frio Pipe Line Co., a gas line which supplies Texas Gas Utilities Corp., has been announced by the West Texas utility. Frio's 46-mile line supplies Texas Gas with 45% of its gas requirements. Major producers having contracts with Frio include Humble Oil & Refining Co. and Texaco.

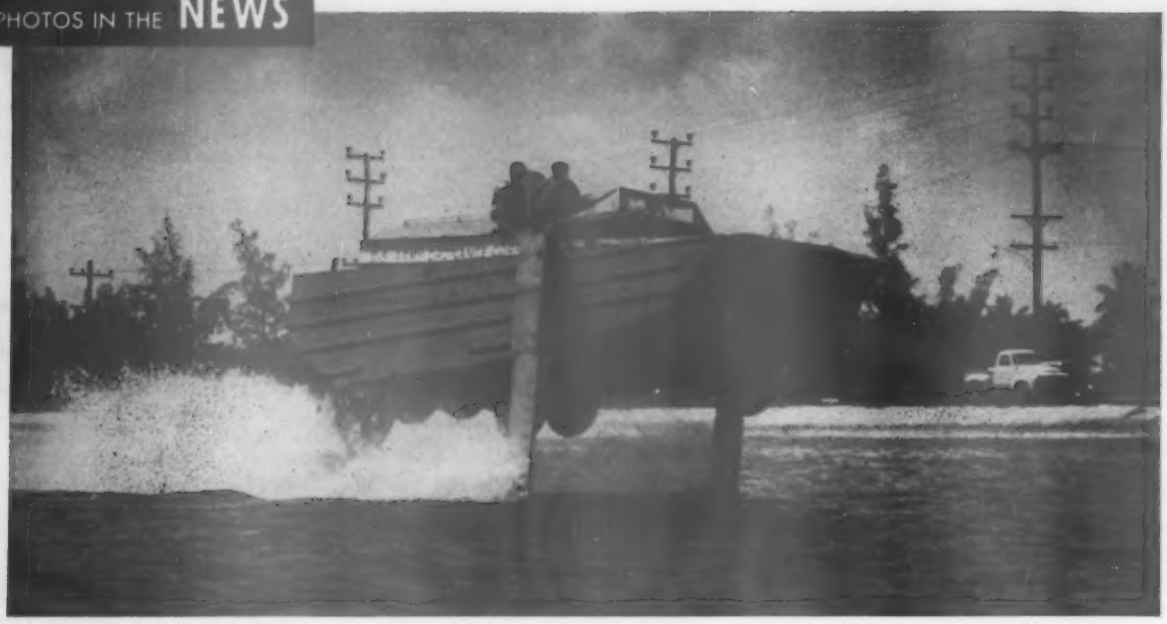
Also for Pipeliners...

THIS WEEK: All intervenors unanimously are opposed to Zwerdling's public-utility formula for setting producers' gas prices (p. 57) . . . Texas Eastern's purchase of Rayne field may set new gas-buying pattern (p. 66) . . . Russia sets goal of a 4,000-mile network of pipelines (p. 80).

NEXT WEEK: Two new pipeline maps and a special 15-page section on pipeline maintenance will feature the annual pipeline issue.

The big 3 by 4-ft. wall map is completely new. It shows crude lines on one side and products on the other with refinery locations and names.

PHOTOS IN THE **NEWS**



The Flying Duck

The strange contraption skimming the water above is the U. S. Army's latest vehicle, a truck that floats like a boat and flies like an airplane.

The Flying Duck can attain water speed of 50 m.p.h. and can operate for about 5 hours with a range of 250 miles. It can navigate rough water and work on the high seas.

Power comes from an 860-hp. Lycoming gas-turbine engine—similar to the kind which normally powers helicopters and airplanes. It can operate on diesel fuel, kerosine, gasoline, jet fuels, or any combination of these.

Lift is gained from two underwater hydrofoil wings fore and one aft. When the vehicle reaches speed of 13 m.p.h., water flowing around the hydrofoil wings acts as air flowing past an airplane wing and lifts the vehicle well out of the water. At full flight the hull is more than 4 ft. above the surface. Avco Corp.'s Lycoming Division developed the vehicle under contract with the Army's Ordnance Corps.

A Tall Lamplighter

With $50 worth of steel rod and a welding torch, two maintenance men at Union Oil Co. of California's Santa Maria refinery put together a unique bulb-changing scaffold that saves the company $500 yearly.

In addition refinery men have found a multitude of other uses for the portable scaffold.

The initial problem confronting John Christian and Ray Jensen was how to change the lights in the 32-ft.-high street standards used around the refinery. Previously, an expensive crane had been leased for the job.

They built the steel scaffold and attached it to a fork lift. Now the bulb changer is easily hoisted to heights of 35 ft.

A 40-Ton Door

This unusual door is used to close off the high-level test cell at Cleveland's Picker Research Center where radioactive isotopes are packaged for industrial and commercial users.

The door actually is an internally braced steel tank filled with concrete about 5 ft. thick. It's so delicately balanced that one person can manually open and close the door.

Picker has one of the nation's most complete radioisotope laboratories for commercial use. The isotopes can be encapsulated in sources up to 1,000,000 curies of cobalt 60—an amount equivalent to the radiation in 1,000,000 grams of radium.

New Unit for Drillers

A tank unit which pneumatically discharges dry cement or mud at a rate of up to 90 tons per hour at drilling sites has been developed by Delta Tank Manufacturing Co., of Baton Rouge, La. It's believed the first of its type for onshore drilling use.

The skid-mounted tank has a 250-cu. ft. capacity, is 10 ft. long and 6 ft. in diameter. Filled through a pressure-tight top hatch, discharge is through a 4-in. diameter hose connected at the rear end. In operation, the unit draws 320 cu. ft. of air per minute at a pressure of 15 psi.

Russia Maps Gas Plans

. . . with goal of a 4,000-mile network of pipelines. First section of the system is completed and ready for use.

RUSSIA is completing the first major link in a 4,000-mile network of natural-gas transmission lines that is designed to give the booming industrial complex in the south and central Urals a new fuel source.

The new network of lines is certain to change the economic face of one of Central Asia's historic regions.

The pipeline system will tap what the Soviets describe as the "largest gas field in the world." It is designed to move more than 2,000,000,000 cu. ft. of gas a day as much as 1,400 miles. The fact that Russia is pushing the Central Asian-Ural pipeline project is evidence the communists believe they have found "almost inexhaustible" supplies of gas in the Bukhara-Khiva depression of western Uzbekistan.

The Russians claim this area of more than 100,000 sq. miles has potential gas reserves of "at least" 46 trillion cubic feet.

The pipelines . . . Already completed and ready for use is a section of the system linking the cities of Bukhara and Samarkand, both of them oases for ancient caravan routes from the Mediterranean to China. The first small section of this line from Jarkak field across the Kyzyl-Kum desert to Bukhara was finished late last year.

The Jarkak - Bukhara - Samarkand line is scheduled to reach Tashkent, about 400 miles farther, by next year. At the end of the new 7-Year Plan (1959-1965) it will have been extended another 500 miles northeast to Alma-Ata, near the Chinese border.

The Russians say, somewhat ominously for the Western world, that the experience already gained in the desert pipelaying will pay off both at home and abroad. Soviet officials say they plan to put their newly acquired know-how to work in "underdeveloped" countries of the Near and Middle East and North Africa where Russian economic and political influence has gained a foothold.

The experience is certain to help them, the Russians say, in laying two 40-in. gas lines from the big new Gazli field near Bukhara to the Ural mountain metallurgical centers of Chelyabinsk and Sverdlovsk. Survey work on these lines, longer than any ever planned for Europe, is well under way.

As a result of aerial and ground surveys, Soviet gas industry officials decided to alter the original routes of the big-diameter lines. Instead of going directly north along the eastern shore of the Aral Sea, the lines will be laid around the sea's western shore. This westerly route through Urgench and Nukus will add 150 miles to the length of each of the lines, but the Russians say the terrain will be less difficult and the new routes will take the lines closer to existing roads and populated areas.

The Gazli-Chelyabinsk line is scheduled for completion sometimes between 1960 and 1963. It will be 1,300 miles long. The line to Sverdlovsk, slated for completion about 2 years later, will cover 1,400 miles.

The Russians say the two lines will require 18 or 20 "large" compressor stations.

A fourth major line tapping new gas fields in the Bukhara-Kiva depression will start at Mubarek, south of Jarkak, with one link going to Stalinabad and the other to Tashkent. Total length will be about 500 miles.

The pipeline crews building lines in this desert region work mostly at night, according to the Russians, to avoid suffocating daytime temperatures which reach 120°. More than half of the Bukhara-Samarkand-Tashkent route crosses salt marshes. The saline soil presents corrosion problems that make "special insulation" for the line necessary.

Many of the pipelaying crews working in this Central Asian desert region are Komsomol members—young communist activists who volunteer for the Soviet Union's construction jobs, pledging to exceed the goals assigned to them. Few are over 30.

The gas source . . . The Russians say they will spend 1,700,000,000 rubles ($425 million at the official exchange rate) on gas development in Uzbekistan in the 1959-1965 period.

Historic Samarkand, plundered by Alexander the Great in the 4th century B. C.; a center of Arab culture in the 8th century; conquered by Genghis Khan in the 13th century; and Tamerlane's capital in the 14th, is slated for chemical plants alongside its mosques and tombs. The Russians say Bukhara is destined to be one of the USSR's largest industrial regions because of its gas.

Gas production in the Uzbek re-

public is expected to top 645,000,000 M.c.f. in 1965 and range between 1.9 and 2.1 trillion cu. ft. in the following 10 years. Gas output from this region was only 6,000,000 M.c.f. last year.

Natural gas now accounts for less than 5% of Uzbekistan's fuel requirements, but the Russians say it will supply 60% of the area's fuel needs by 1965.

The Russians claim Gazli, Jarkak, Mubarek, and other gas fields of the Bukhara-Kiva depression have three times the gas reserves of the much-publicized Stavropol fields of the northern Caucasus. The Russians previously have described Stavropol's gas wells as "the most productive in the world." These fields supply the 800-mile pipeline to Moscow which is now being extended to Leningrad.

Soviet reports say the discovery of gas in the Bukhara region in 1953 was the "greatest event in the Russian gas industry history." The first significant gas strike was at Setalan-Tepe, 37 miles south of Kagan. Jarkak, southeast of Kagan, was the second big discovery.

Drilling was started at Gazli, 70 miles northwest of Bukhara, in 1956. Russians now say the Gazli field is 25-28 miles long and 6-10 miles wide with gas-bearing sands more than 2,000 ft. thick; has six productive zones from 1,700 ft. to 3,900 ft.

When it goes on full production Gazli is expected to produce as much gas as the entire Soviet Union was producing early in 1958, a little more than 2,000,000 M.c.f. daily.

Shell's New Barge Heads for Persian Gulf

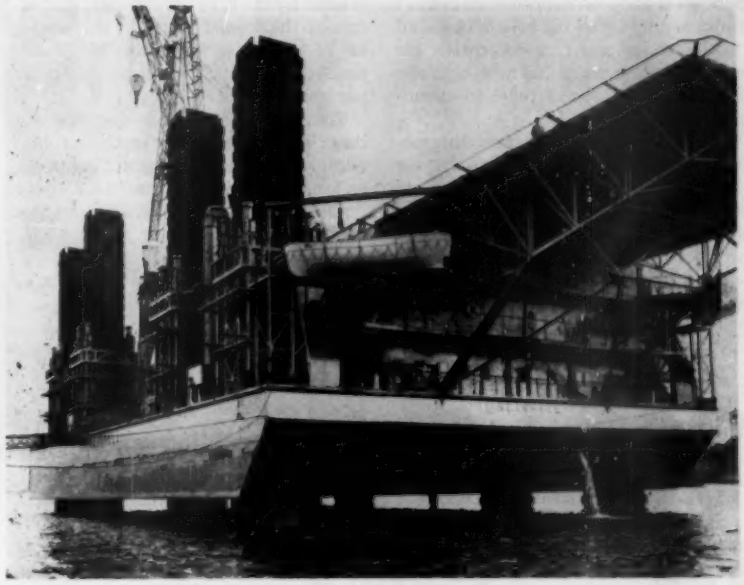
A NEW drilling barge on its way to the Persian Gulf bears a fanciful name, but it's built for rugged duty down to the last weld.

The "Seashell" was built in a Netherlands shipyard for Shell Co. of Qatar, a Royal Dutch-Shell subsidiary. It is now on a 6,400-mile trip to Qatar, where it will replace a mobile platform lost in a freak accident 2½ years ago.

The original unit foundered while under tow to a third location after drilling two dry holes on a concession covering Qatar's offshore areas outside the 3-mile limit.

The "Seashell" has been redesigned to withstand gales up to 100 mph. and waves up to 30 ft. high, while drilling in 90 ft. of water. The 210-ft. by 110-ft. platform stands on eight legs. The legs can be lengthened to 220 ft. in five sections.

A rig platform area of nearly 14-ft. square will permit the drilling of several directional wells in the 15,000-ft. range without moving the barge. All power will be supplied by diesels. A hinged helicopter deck projects over the water. It can be folded safely out of way during towing operations.



At the time the "Seashell" was ordered, the company planned to drill its first wildcat in the northern half of the concession area. The proposed location is 35 miles from the nearest land, about 65 miles north-northeast of Doha, and in 80 ft. of water.

Indiana Standard Bids for Thailand Plant

STANDARD OIL CO. (Ind.) has gone a long way from the Middle West in a bid to build its first foreign refinery.

The company is clashing head-on with established marketers in Thailand for an option to build the country's first refinery. It has confirmed that it is negotiating with the Thai Government over the plant, but it has denied reports from Bangkok that it has made the winning offer.

The refinery would be a move in a new direction in the international oil business for Indiana Standard. The company in recent years has aggressively moved into the foreign exploration picture. It has acquired concessions in such places as Venezuela and the Persian Gulf waters off Iran and has negotiated a major development contract with Argentina.

But the Thailand refinery project would be a step toward making the company an integrated international oil company.

Reports from Bangkok are that the Thailand Cabinet has approved a proposal by Eastern Petroleum Corp. for a 25,000-bbl. refinery. The plant could be expanded later to 35,000 bbl. Cost of the project would be more than $33 million. The plant would be turned over to the government after 10 years of operation.

Eastern Petroleum is handling the negotiations for Indiana Standard. But it is not a subsidiary.

The Indiana Standard offer is competing with a joint proposal by Standard-Vacuum Oil Co. and Royal Dutch-Shell. It calls for a 35,000-bbl. plant, with 25% interest held by Thai interests, either private or public. Stanvac and Shell, together with Caltex, are virtually the only local marketers. Demand this year is expected to be more than 20,000 bbl. daily.

Peruvian Oil Bolstered

. . . by boost in product prices. Premier braved political repercussions to make drastic move, and it's paying off.

A DYNAMIC new premier is putting both Peru and its oil industry back on their feet.

In the weeks since Pedro G. Beltran risked touching off a political powder keg by decreeing higher product prices, the country appears to have started making its way out of an economic morass, and the oil industry has begun to move off dead center.

Premier Beltran is a straight-talking, London-trained economist who doesn't mince words about his beliefs in sound fiscal policies and free enterprise. He is a newspaper publisher who was the chief critic of the 3-year-old democratic government.

Oil companies, of which International Petroleum Co., Ltd., is by far the largest, had been more and more reluctant to invest in Peruvian operations in the face of abnormally low product prices. Oil men for years had warned the industry would suffer if prices were kept down by price controls.

Beltran quickly raised prices on gasoline and other products. He parried possible reaction by authorizing increases in transportation fares and salaries for some of the lower paid wage groups. So far, except for a brief strike by taxi drivers, the higher product prices have been accepted with comparative calm.

New prices . . . The retail price of regular 66/67 octane gasoline was raised from 8.34 cents per gallon, one of the lowest levels in the world, to 14.17 cents. Premium 76/77 octane rose from 9.37 cents to 18.6 cents per gallon.

Kerosine, which had sold for 3.4 cents per gallon, was separated into two grades, domestic for 4.2 cents per gallon, and industrial, for 11.7 cents.

Diesel oil was raised from 3.4 cents to 11.54 cents. Bunker fuel was increased from 3.52 cents to 7.4 cents, and No. 6 bunker fuel from 3.52 cents to 6.23 cents.

Industry obligation . . . International Petroleum, which produces 90% of the country's 48,000 bbl. of crude daily as operator for itself and for properties held jointly with Cia. Petrolera Lobitos, can now pick up where it left off in its development program.

The company stopped drilling in the middle of a $40-million expansion program earlier this year.

The decree also specifies that companies are to reinvest not less than 50% of the annual depreciation allowance, plus 50% of the net profit after taxes. The investments will be made in exploration, drilling, refining, storage, and other operations. This level of investment will mean a stepped-up operation in the Talara area.

The administration also will ask the Peruvian Congress to make provisions of the 1952 oil law apply to La Brea and Parinas concessions, which were awarded several years before the law went into effect. This would permit International and Lobitos, holders of the concessions, to sell products in Peru at international market prices, less transportation savings.

The two companies will have a crude export limitation of 20%. But the proportion can be raised if enough reserves are developed.

Venezuela Ready to Head Off Oil Strike

THE VENEZUELAN government is making it clear that it will not tolerate a crippling oil industry strike.

The young, democratically-elected government is bending over backwards to let the oil workers union and companies work out an agreement without interference.

But at the same time, word is being spread that the country cannot afford an industry-wide strike. High government officials are quietly reminding the nation that when the national economy or security is threatened, the president can legally order workers back to their jobs.

The government has come out flatly against a union demand that all contracting services be eliminated. Both J. P. Perez Alfonzo, Minister of Mines and Hydrocarbons, and Dr. Louis Hernandes Solis, Minister of Labor, have defended the role of service companies in the complex oil industry. The labor minister, however, added that he favors awarding service contracts only to companies which stay within the labor contract.

Union eyes U. S. . . . The union has lost no time in answering the government in the Venezuelan press.

Manuel Penalver, a member of the board of the Venezuelan federation of oil workers, said the demands are patterned after conditions in the U. S. oil industry, and that it will stick by them.

He did say the union would back down on some points, but will insist on the main features. These are the elimination of contracting companies, a salary increase graduated from 20% on lowest wages down to a minimum of 15% on earnings of $600 per month, and 56-hour pay for a 40-hour week.

The union estimates that its demands would cost companies $180 million per year. Companies unofficially estimate the cost at more than $270 million.

The union promises to fight hard for the elimination of contracting companies as they now exist. This would be done by making oil companies responsible for keeping benefits up to par for workers employed by its contractors, subcontractors, and middle men.

The union complaint with contractors is that employment is not steady and that wages and benefits do not match those of oil company employes.

Penalver said that if the clause holding companies responsible for contractors' employes is agreed on, the union would be willing to let some contractors stay in business.

Government view . . . The squabble highlights the fact that on many questions the government has a distinctly different outlook from oil workers.

A major strike would take more income from the government's pocketbook than the industry's, and the government knows the industry can only raise wage rates so far if it is to stay healthy in the face of international competition.

Whenever oil wages go up, the government is faced with an internal problem of greater demands by workers in smaller, local industries.

The government also discounts the argument that wages should be geared to increases in company earnings, a major issue in the steel strike in progress in the U. S. Venezuela contends that excessive profits should be whittled down by taxes.

ADDITIONAL DATA: Improved Cages

MARTIN RUBBER GUIDE CAGES BY

PAT. NO. 2,591,174

Metallic back-stop is now available in Closed Type Cages by use of 18-8 insert in upper part of rubber guide. Ball never touches this metal in normal pumping.

Metallic back-stop is now provided in Open Type Cages by leaving cross bar above primary ball stop position. Ball never touches this metal in normal pumping.

THE WORLD'S MOST SUCCESSFUL
NOW EVEN BETTER!

The Martin Rubber Guide Idea, which has proven successful beyond anyone's expectation, is now available in improved form. The primary rubber ball stop for normal operation is now backed up by a metal stop to take the unusual ball impact which sometimes occurs.

Easily replaceable, mechanically held rubber guides often permit the renewal of cage life several times. They outlast metal by a great margin and usually increase ball and seat life two or more times.

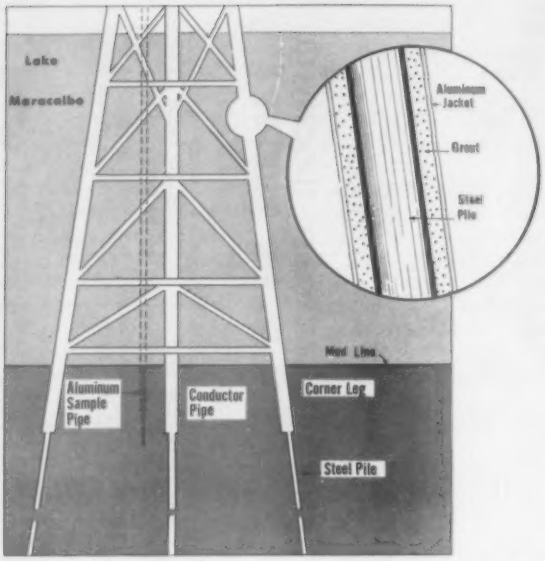
Many production men specify MARTIN CAGES in all their pumps. Our cages are available in all sizes and types to take care of anyone's requirements.

JOHN N. MARTIN

Manufacturer

9 W. BRADY STREET • TULSA, OKLAHOMA

ALUMINUM TEMPLATE, laterally braced with extruded aluminum shapes, is used as offshore structure in Lake Maracaibo. Steel piles driven through the hollow legs give the structure adequate strength. Fig. 1.



GROUT SEPARATION of aluminum and steel in the offshore structure is shown in the section at right. Other details shown at left include sample pipe location and configuration below mud line. Fig. 2.

Aluminum withstands corrosive effects

BY R. S. DALRYMPLE
Chief Corrosion Engineer,
Reynolds Metals Co.

• An 8-year test program and 2 years' experience with oil installations show that the high concentration of oxygen helps protect aluminum which is rendered passive by an oxide film.

STEEL PIPE after 12 months in Lake Maracaibo at a depth of 60 ft. The pipe is 4-in., Schedule 40. Fig. 3.

ALUMINUM, properly employed, performs with a high degree of corrosion resistance in petroleum-industry applications in Lake Maracaibo.

This conclusion has considerable significance, in view of the extreme corrosion problem presented oil operators by the Venezuelan lake. Rich in oxygen and relatively high in temperature, these waters effect a greatly accelerated corrosion in the ferrous metals (see Fig. 3), traditionally used in the oil industry's marine operations.

The abundant oxygen, so damaging to ferrous alloys, helps protect aluminum, since aluminum owes its passivity to a natural, thin oxide film.

The financial and operational headaches produced by the corrosion problem led to the initial Lake Maracaibo experiments with aluminum about 10 years ago. The tests reached their fruition in 1957 when aluminum found a place in offshore structures and in underwater flow lines.

First tests . . . The pioneering tests on aluminum in Lake Maracaibo were

TYPICAL WELD on aluminum after 14 months in Lake Maracaibo, at 31 ft. below mean lake level. Pipe and weld were stained but not corroded. Fig. 4.

WHEEL CUT in 6-in., Schedule 40 aluminum pipe after 14 months in lake. Cut was 60 to 65 ft. below water line. Fig. 5.

# of Maracaibo's warm, oxygen-rich waters

begun by Creole Petroleum Co. in July 1949. These first installations were aluminum flow-line risers used as replacements for steel risers which failed from corrosion in 3 years' service.

Despite the fact that no electrical insulation was used between the aluminum and steel pipe sections, the aluminum risers lasted 9 years. Thus, although a very adverse galvanic corrosion problem existed, the aluminum pipe outlasted the same schedule steel pipe by two lifetimes.

Flow-Line Experiments

With this experience as a background, Creole installed in 1956 an experimental underwater aluminum flow line. This line, 700 ft. long, was fabricated from 4-in. Schedule 40 alloy 6062 pipe. The pipe sections were joined by shielded-arc hand welding using alloy 4043 weld wire. One weld was made with alloy 5154 weld wire.

In laying the experimental 4-in. flow line, efforts were made to prevent galvanic corrosion by the use of insulating flange assemblies at both the well and the flow-station end of the line. Efforts also were made to place the aluminum line so it would not physically contact any steel flow lines on the lake bottom.

The experimental underwater line was pulled up for inspection after 21 months' service. Corrosion engineers from Creole and I checked the line thoroughly.

The evidence presented by the experimental pipe was most encouraging; however, indications were that the insulating flanges may not have performed satisfactorily. This was particularly true at the well end riser, which exhibited a highly polished appearance indicative of galvanic corrosion. At this location there appeared to have been a uniform removal of metal to a depth of 0.002 to 0.003 in., accompanied by localized pitting to a depth of not over 0.007 in.

Improved techniques are now available for insulating flanges, which should solve this particular problem.

Accelerated galvanic corrosion was noted at the bottom of the riser at the flow-station end of the line and at two locations midway between the flow station and the well. The maximum pit depth at these locations was 0.030 in. Rust stains were noted on the aluminum pipe at the pitted areas. These stains and the presence of steel lines in the vicinity of the pitted areas lend credence to the belief that the aluminum pipe rested at the areas of corrosion in contact with steel flow lines.

Away from these areas of attack, whether buried in the mud or exposed directly to the lake water, the aluminum flow line was virtually free from corrosion. In fact, the extrusion and draw marks could still be clearly seen, indicating virtually perfect preservation.

There was no evidence of accelerated corrosion associated with the weld metal whether alloy 4043 or 5154. The heat-affected zones adjacent to the welds were stained a dark color, but no appreciable attack could be observed.

Aluminum lines laid . . . On the basis of the performance record of the test line, Creole decided to lay an extensive system of aluminum underwater flow lines. To date, nearly 20 miles of 4-in. Schedule 40 pipe have been laid. Superior Oil Co. of Venezuela has also laid several miles of aluminum flow-line pipe. The welding of pipelines was done by an automatic pipe welder perfected by Reynolds Metals Co. and Air Reduction Sales Co.

Offshore Structures

Performance of the test line also led to the design of aluminum offshore drilling structures as an answer to another phase of the Lake Mara-

caibo corrosion problem. Drilling platforms, such as ordinarily used in the Gulf of Mexico, are usually constructed of steel. Steel, however, is subject to rapid deterioration in Lake Maracaibo. For this reason, most of the lake's 7,000 offshore drilling platforms have been erected on concrete piles.

Early in 1957, engineers of J. Ray McDermott & Co. and Reynolds Metals Co. worked together to design an offshore structure which would incorporate the structural strength of steel with the corrosion resistance of aluminum. This was done by means of an aluminum template with hollow legs through which steel piles were driven. The aluminum skin shielded the steel piles from the corrosive action of Lake Maracaibo.

These structures incorporated lateral bracing using extruded aluminum shapes. This structure is illustrated in Fig. 1. To date 58 of these structures, using 4,650,000 lb. of aluminum, have been installed.

The template comprises four legs of 34-in. diameter, a center conductor guide of the same size, and connecting lateral bracing. The template was fabricated from plate and extrusions of alloy 6061, the same family of aluminum alloys used in the Creole test. Joining was accomplished by semiautomatic inert-gas consumable arc welding, using 4043 filler wire.

Preventing galvanic corrosion . . . Two steps were taken to prevent galvanic corrosion between the aluminum template and the steel piling.

The first step was a design feature. Insulating spacers made of steel and rubber were used in the four legs and in the center conductor guide.

The second step was the grouting of the annulus between the aluminum and the steel legs to maintain physical separation between the two dissimilar metals. A special grout containing portland cement, sand, and possolana was used. After considerable research during the structure's design stage, a process was developed for obtaining all the desired qualities in the grout insulation without affecting the friction bond between the aluminum and the grout. This friction bond is absolutely necessary to the aluminum template structure because it transmits the load from the template to the steel pilings when the structure is subjected to lateral loading (see Fig. 2).

At the time the structures are set, every precaution is taken to insure complete electrical separation between the aluminum template and the steel pilings.

The existence of a potential difference between the steel piles and the aluminum template of 0.2 to 0.3 volt has been determined to indicate that no electrical contact exists between the pilings and the template. Shorting of the steel pile to the aluminum template reduces the potential to zero.

Measurements of the potential difference between the aluminum template and the steel pilings are made when the piles are inserted, and then again after the piles have been driven but before grouting. Additional measurements of potential difference are then taken after the grouting, after the wells have been drilled, and at regular intervals thereafter to insure that there is no accidental electrical contact between the template and the piling.

Preventing oxygen-depletion cells . . . Oxygen-depletion cells (stagnant-water areas) which might have been locations of accelerated attack are prevented in the aluminum template by (1) sealing the hollow lateral bracing structurals by welding, and (2) by grouting in the annulus between the legs and the steel piles.

Corrosion monitoring . . . Installed into, and electrically connected to, these first four aluminum templates were full-length sections of 6-in. Schedule 40 alloy 6061-T6 aluminum pipe. These pipes, referred to as "pipe samples," were secured to the aluminum templates by a metal pipe clamp. This assured an electrical continuity with the template and, therefore, a mirror of the corrosion behavior of the template.

The pipe samples were designed to cover the full range of exposure of the template to which it was attached. Therefore, the pipe sample was of such length to be exposed from about 5 ft. above the water line to about 10 ft. below the mud line (see Fig. 2).

To further simulate the construction details of the templates, each pipe sample contained a 20-ft. length of steel pipe (bare) grouted into the bottom section of pipe and insulated from it. The steel pipe is placed so that a 10-ft. length extends beyond the aluminum pipe sample into the mud. The annular spacing between the sample pipe and the steel pipe is the same as between the legs of the aluminum template and the steel piles. This duplicates the geometry of the legs of the template.

The test pipes are being checked periodically for two reasons: (1) to establish the appearance of the same pipe section as a reference for future examinations, and (2) to demonstrate that no deleterious corrosion is occurring.

Test pipe sections in three structures have been examined after 3 months', 7½ months', and 14 months' service. These pipe samples are on platforms owned by Superior Oil Co. of Venezuela (2 Lama well, examined at all three intervals), Venezuelan Sun Oil Co. (well No. 5, examined at 7½ months and 14 months).

The remaining test pipe is attached to an aluminum flow station owned by Signal Oil Co. of Venezuela and will not be examined until several years of service have elapsed.

Minor attack . . . From the water line to a depth of about 30 ft., the aluminum sample pipes appear to be undergoing minor attack to a maximum depth of 0.007 in. The attack does not tend to increase in depth but rather grows laterally.

From 30 to 40 ft. below the water line to below the mud line, there is no significant corrosion on the aluminum.

Fig. 4 illustrates a weldment of aluminum pipe after 14 months' exposure at 31 ft. below mean lake level. The heat-affected zones on either side of the weld are stained a dark color but were not attacked. The dark stain proceeding from the weld towards the top of the photograph is an "extrusion streak" which possessed different stainings characteristics as compared to the bulk of the pipe.

Fig. 5 illustrates a wheel cut put in the sidewall of a test pipe to facilitate its placement. This cut was 60 to 65 ft. below mean lake level. Note that 14 months' exposure has not even stained the edges of the cut nor corroded away the foil-thin "burrs."

It is interesting to conjecture on the possible reasons why the aluminum pipe sections were subject to corrosion only on those portions above the 30-ft. to 40-ft. mark. It was at first considered a thermal effect. Recent data have shown no marked thermal layers in that portion of the lake where these test pipes are located.

A tentative conjecture is that a corrosion cell exists between the upper portion of the pipe and the lower portion with the latter being the cathode. Factors which might influence this cell are: Temperature difference, oxygen concentration, salt concentration.

As noted earlier, Lake Maracaibo possesses a fairly uniform temperature from surface to mud line (80°-90° F.), The oxygen content decreases in a fairly uniform manner from saturation at the surface to less than 1 ml.

per liter below 60 ft. The salt concentration varies markedly during the year and from year to year and may range from 300-700 p.p.m. at the surface of the lake to as much as 8,000 p.p.m. at a depth of 110 ft.

It is probable that a combination of these factors has given rise to the conditions observed. Many more years of experience in Lake Maracaibo will be required to answer this problem.

The samples of 2-in. steel pipe, grouted into the bottom end of the aluminum sample pipes, were completely covered by mud. These steel pipes had not been attacked to any appreciable extent during the test.

Simultaneous Test of Aluminum and Steel

Another very significant test operation has also been conducted. At its 6 Lama well, Superior placed in test both an aluminum pipe and a steel pipe. The aluminum section comprised extruded 6-in. Schedule 40 alloy 6061-T6 tubes, joined with couplings cast in alloy 356. The 4-in. Schedule 40 steel pipe was installed bare.

In both cases the pipes were exposed from above the water line, through the lake water and into the mud. The lake was 100 ft. deep.

Because of the manner in which the pipes were suspended, they were electrically connected to the steel conductor pipe, forming a galvanic corrosion cell in which the aluminum was the anode. Because of either a mechanical failure in a coupling or an accident affecting a coupling, the aluminum pipe was separated at the 20-ft.-depth mark. However, this mishap did not affect the basic results of the experiment.

Both pipes were left in the water 6 months. At the end of this period, the aluminum pipe showed accelerated corrosion, resulting in a uniform removal to a depth of 0.002 in. This uniform metal removal was accompanied by formation of numerous small pits, the maximum depth, measured in 50 of the pits, being 0.016 in. The remaining 80 ft. of aluminum pipe was left on the lake bottom for an additional 6-month period. At this time it was raised and examined. No increase in corrosion was measured over that observed after 6 months' exposure.

Steel corrosion . . . After 6 months' exposure, the bare steel pipe exhibited severe corrosion damage above the mud line. The maximum pit depth was at the air-water interface and was 0.125 in. Below the water line were large scabs of rust which increased in frequency and size with increasing depth. At approximately 30 ft. below the water surface, the entime surface of pipe was covered by a gelatinous rust-colored deposit. The maximum pit depth in the first 30 ft. was 0.075 in.

Below the 30-ft. mark the corrosive attack was so extreme it was virtually impossible to measure localized corrosion pits. The attack was so severe that a pipe coupler located approximately 60 ft. below the water line was almost unrecognizable.

After 12 months' exposure, the water line on the steel pipe was encrusted in a rock-hard deposit of corrosion product making it impossible to measure the pit depth. Subsequent to the on-site examination of the steel pipe, pieces of the pipe were sectioned for examination. Pinhole pits to a depth of 160 mils (0.160 in.) or 80% of the pipe wall were reported. The extensive attack on the steel pipe is illustrated in Fig. 3. That section of the steel pipe which had been in the mud was virtually free from corrosion.

The specific results of these tests can be summarized as follows:

- Aluminum alloys 6061 and 6062 immersed in Lake Maracaibo are subject to only minor corrosion. This attack is confined to that portion of the aluminum exposed from the water line to 30-40 ft. below the water line. Below this zone and into the mud on the lake bottom, aluminum is virtually free of attack.
- Galvanic couples between aluminum and steel in Lake Maracaibo accelerate corrosion of aluminum. No serious deterioration of aluminum from this cause would be deduced from this test program.
- Unprotected steel line pipe suffers serious corrosion damage from Lake Maracaibo water. This damage virtually ceases at the mud line.

Cosden pushing polybutene production

COSDEN Petroleum Corp. of Big Spring, Tex., is moving quickly to meet the growing demand for polybutene. The company recently announced it has:

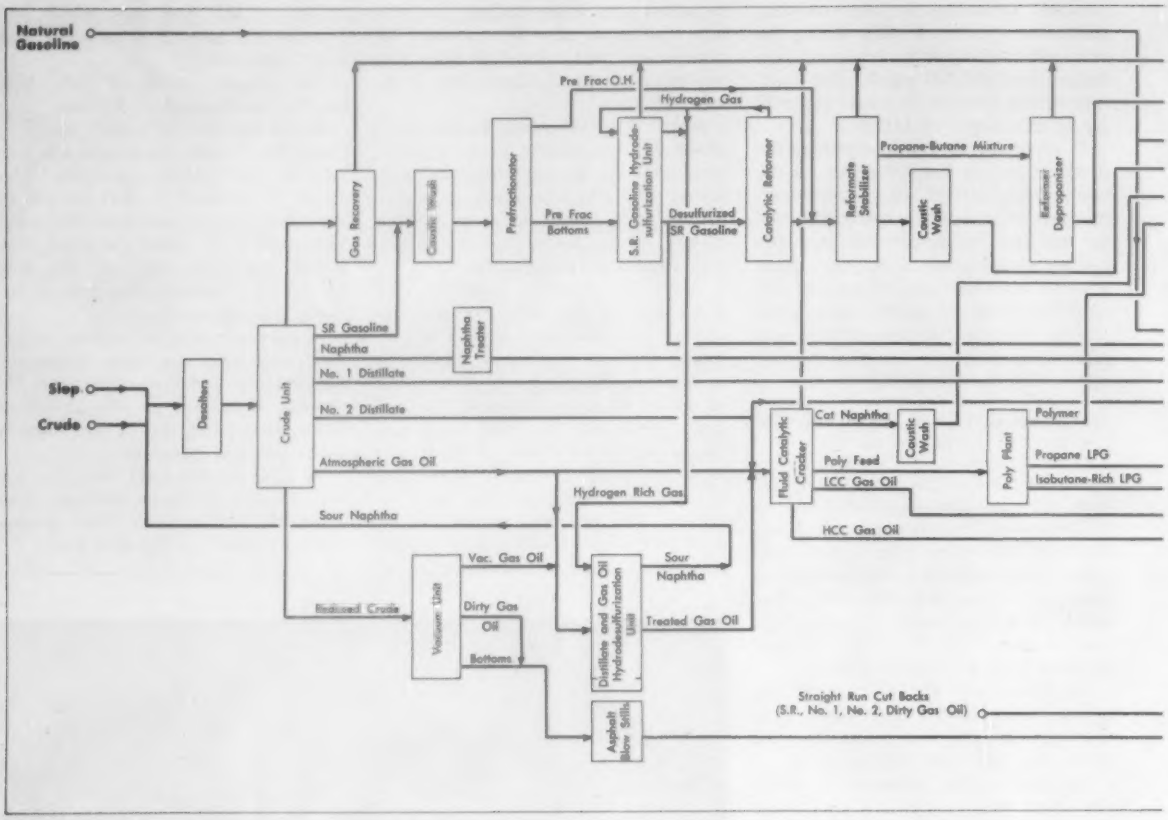
. . . Licensed its process for making polybutene to Texas Butadiene & Chemical Corp.

. . . Doubled capacity for making this chemical specialty at the Cosden refinery.

Texas Butadiene will manufacture polybutene with the Cosden process at its Channelview plant near Houston. A successful demonstration run already has been completed at Cosden's Big Spring refinery using Texas Butadiene feed stocks.

Cosden will market Texas Butadiene's entire output. Since 1956, Cosden has marketed a complete line of isobutylene polymers under the trademark "Polyvis." Now with Texas Butadiene's butane-cracking facilities, an almost unlimited supply of isobutylene is available for "Polyvis" production.

Completion of the major expansion for polybutene output at Big Spring makes it possible for the Cosden refinery to produce 2,400,000 gal. per year. The chemical is used in making lubricating-oil additives, pressure-sensitive adhesives, caulking and sealing compounds, protective finishes, and industrial lubricants.



Kerr-McGee's experience with

Catalytic desulfurization of cat cracker

Among new units installed at the Wynnewood, Okla., refinery is a distillate hydrodesulfurization unit. Presently a mixture of vacuum and atmospheric gas oils is fed to this unit. Operating data are given on cat cracking of the hydrogenated gas oils. Some profit is realized by this operation, but more important is the flexibility with regard to product quality improvement.

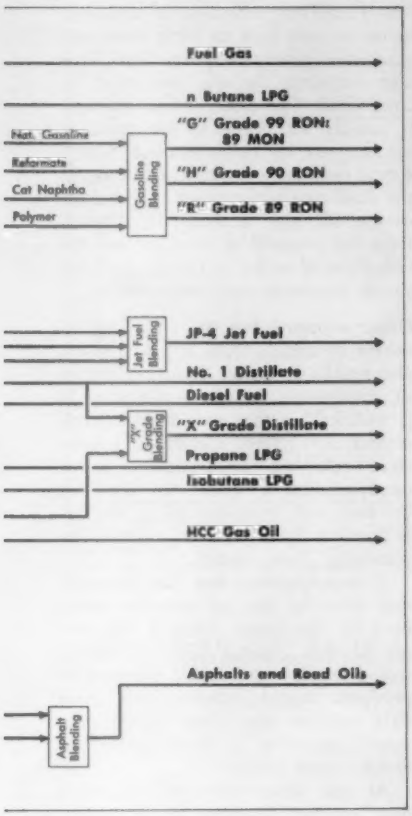
IN 1945 Kerr-McGee Oil Industries, Inc., purchased Cosco (the old Cosden Oil Co.) and took over operation of the Wynnewood refinery in Oklahoma. At that time Kerr-McGee was known primarily for its manufacture of asphalts and asphalt derivatives. In 1952 a new crude and vacuum unit was installed which increased crude-running capacity to 18,000 bbl. per day. In 1954 a fluid catalytic cracking unit and cat poly facilities were added. When this expansion was completed the Wynnewood refinery was self-sufficient and capable of producing a full line of fuels and asphalts.

However, the need had been foreseen for additional processing equipment which would be installed primarily for improvement of product quality. Accordingly, new units were installed and in operation by September 1958, including facilities for: (1) catalytic reforming of straightrun gasoline, (2) catalytic hydrodesulfurization of straightrun gasoline, and (3) catalytic hydrodesulfurization of distillate fuels. With these new units it is possible to produce gasolines and distillate fuels which would meet product specifications expected for the next several years. Fig. 1 is a block diagram of the Wynnewood refinery as it is today.

The distillate catalytic hydrodesulfurization is a relatively new process in the industry. There are only a limited number of similar units in the United States operating commercially. This treater is designed to operate on several feed stocks. These stocks include light cat cycle oil, No. 2 distillate (a straightrun fraction boiling in the diesel-fuel range), and a mixture of vacuum and atmospheric gas oils which serve as feed stocks for the fluid cat cracker. Facilities are being installed which will allow hydrogenation of No. 1 distillate of a high grade-low sulfur burner fuel.

Since the product quality of Kerr-McGee's distillate fuels is satisfactory at this time without hydrogenat-

Paper presented at Western Petroleum Refiners Association meeting at Wichita, Kans.



BLOCK FLOW DIAGRAM of Kerr-McGee's Wynnewood, Okla., refinery as it is today. Originally the refinery was noted primarily for its asphalt manufacture. However, a program of expansion over the years has made this refinery self-sufficient and capable of producing a full line of fuels and lubricants. Fig. 1.

BY HAROLD T. CONNALLY

. . . process assistant to the vice president of refining, Kerr-McGee Oil Industries, Inc. Prior to this he served for 2 years as operations manager at the Wynnewood refinery. Other experience includes a position as refinery consulting engineer with George Armistead & Co. in Washington, D. C.; senior chemical engineer in refinery technical service with DX Sunray Oil Co. at Tulsa; and engineer in pilot-plant group of Celanese Corp. of America working on oxidation of light hydrocarbons to organic chemicals. Connally has a BS in chemical engineering from University of Oklahoma, obtained in 1948, and an MS in chemical engineering from University of Michigan, obtained in 1949.

charge stock

ing, a mixture of vacuum and atmospheric gas oil is charged to the distillate hydrodesulfurization unit.

Catalytic Hydrogenation

Some of the primary reactions which take place during the hydrogenation of oils are shown in Table 1. The first reaction is a typical desulfurization step. In this case, ethyl-butyl sulfide reacts with hydrogen to form hydrogen sulfide, ethane, and butane. The second reaction shows how hydrogen reacts with phenol to form benzene and water. The third reaction is that of hydrogen and pyridine to form pentane and ammonia. This reaction is important in the hydrogenation of cat cracker feed stock; ammonia and nitrogen compounds tend to deactivate the fluid catalyst in the cat cracker, resulting, among other things, in reduced cat naphtha octanes.

Metals contamination . . . However, the fourth reaction is the reaction of most interest at Wynnewood. No attempt has been made to express this reaction in chemical form since the exact mechanism by which it proceeds is not known. It is sufficient to say that this reaction cleans the gas oils at Wynnewood which are heavily contaminated with metals. These metals also tend to poison and deactivate the fluid catalyst.

Gum formers . . . The last reaction is a saturation step showing heptene-2 reacting with hydrogen to form heptane. This is an important reaction in the treating of distillate fuels since olefins tend to form gums while products are held in storage. Reactions 2 and 3 also reduce gum-forming tendencies of the treated fuels. Gums in distillate fuels have been the subject of numerous papers. It is expected that distillate-fuel specifications of the future will be more restrictive as to permissible gum content.

Hydrogenation Unit

Corrosion . . . On this unit, corrosion of equipment is watched closely. During the hydrogenation reactions, hydrogen sulfide and ammonia are produced as byproducts. In addition, hydrogen chloride is produced as a byproduct of the straightrun gasoline hydrogenation step, and is carried into the treater along with hydrogen. These compounds combine to form ammonium sulfide and ammonium chloride, both of which are corrosive to admiralty metal. They are to some extent corrosive to steel.

In addition to being corrosive, these

TABLE 1—TYPICAL CATALYTIC HYDROGENATION REACTIONS

1. Decompose sulfur compounds into hydrocarbons as H_2S:

$$C_2H_5{-}S{-}C_4H_9 + 2H_2 \rightarrow C_2H_6 + C_4H_{10} + H_2S$$
(ethyl butyl sulfide + hydrogen) (ethane + butane + hydrogen sulfide)

2. Hydrogenate oxygen compounds into hydrocarbons and water:

$$C_6H_5OH + H_2 \rightarrow C_6H_6 + H_2O$$
(phenol + hydrogen) (benzene + water)

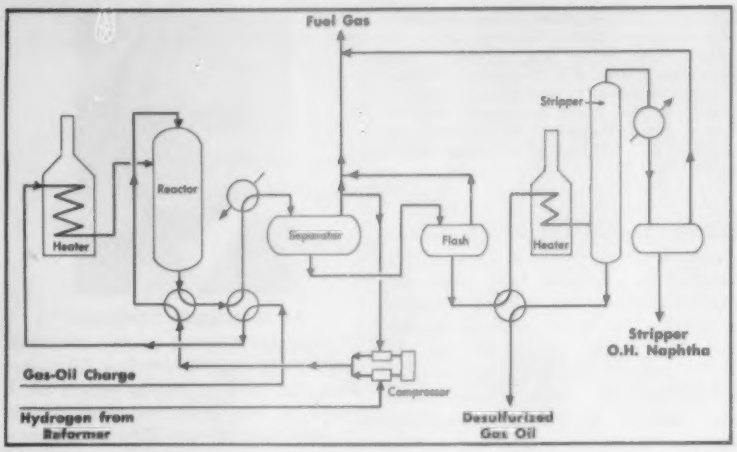
3. Convert organic nitrogen compounds into hydrocarbons and water:

$$C_5H_5N + 5H_2 \rightarrow C_5H_{12} + NH_3$$
(pyridine + hydrogen) (pentane + ammonia)

4. Metallo-organic compounds are apparently decomposed, with the metal portion being retained on the catalyst by either absorption or chemical reaction.

5. Saturate olefins:

$$C_2H_4 = C_5H_{10} + H_2 \rightarrow C_7H_{16}$$
(heptene-2 + hydrogen) (heptane)



DISTILLATE and gas-oil hydrodesulfurization unit at Kerr-McGee's Wynnewood refinery. There are a limited number of similar units in the United States. This unit at Wynnewood is designed to operate on several feed stocks including: light cat cycle oil, No. 2 distillate (straightrun fraction boiling in diesel-fuel range), and a mixture of vacuum and atmospheric gas oils which serve as cat cracker feed stock. Fig. 2.

compounds will sublime and tend to drop out from the gas as solid deposits wherever cooling of the gas takes place. To take care of corrosion, a corrosion inhibitor is injected in the stripper overhead vapor line. Provisions are being made to inject inhibitor ahead of the main reactor products condenser.

The injection of steam condensate ahead of this condenser aids in the removal of salt deposits which drop out upon cooling. In those places which cannot be effectively protected from corrosion by inhibitors, special stainless-steel alloys and monel linings have been used.

Catalytic Cracking of Hydrogenated Gas Oils

In Kerr-McGee's experience, it has found that hydrogenation removes metals to a great extent, it removes nitrogen to a lesser degree, and it removes sulfur to a low level.

Commercial data . . . Table 2 shows commercial operating data obtained from the Wynnewood unit on a mixture of untreated and hydrogenated vacuum and atmospheric gas oils. The hydrogenated feed stock has excellent cat cracker feed-stock characteristics. Note the reduction in metals, carbon residue, and sulfur.

Pilot data . . . An idealized picture of the improvements to be expected by charging this hydrogenated feed stock is shown in Table 3. These are theoretical yield and product quality data based on pilot-plant correlations. Note the increase in cat naphtha yield, the decrease in coke make at constant conversion, and the increase in the octanes of the cat naphtha when cat cracking a hydrogenated feed stock. Bear in mind that these data were obtained from correlations, and therefore can be used only to predict trends.

The increase in cat naphtha yield is usually attributed to the hydrogenation of chemically complex heavy oils which are aromatic or asphaltic in nature and tend to form coke and gas when catalytically cracked. This also accounts for the reduction in coke yield. The clear octane increase is usually attributed to the removal of nitrogen by hydrogenation which would ordinarily produce ammonia in the fluid catalytic cracker. The leaded octane increase is thought to result from the removal of nitrogen and the reduction of sulfur in the cat naphtha which increases lead susceptibility.

Other expected benefits . . . The removal of metals from the feed stock also results in higher liquid recoveries of catalytically cracked products. It is well known that vanadium, nickel, copper, and related metals will poison fluid catalysts. Theoretically, lower catalyst-addition rates to the cat cracker, and consequently, a savings in catalyst costs can be realized by removing these metals.

It was decided that catalyst-addition rates to the cat cracker would be kept the same. Thus it was expected that catalyst yield selectivity would improve and liquid recovery of products would increase. All these data indicate that there is an economic incentive to hydrogenate cat cracker feed stocks.

At this time sufficient operating data are not available to determine commercially if all of these benefits have been obtained. However, some of the expected advantages have been observed from operating and yield reports. Table 4 shows some of the

TABLE 2—TYPICAL ANALYSES OF GAS-OIL FEED TO HYDRODESULFURIZATION UNIT AND TREATED GAS OIL FROM UNIT

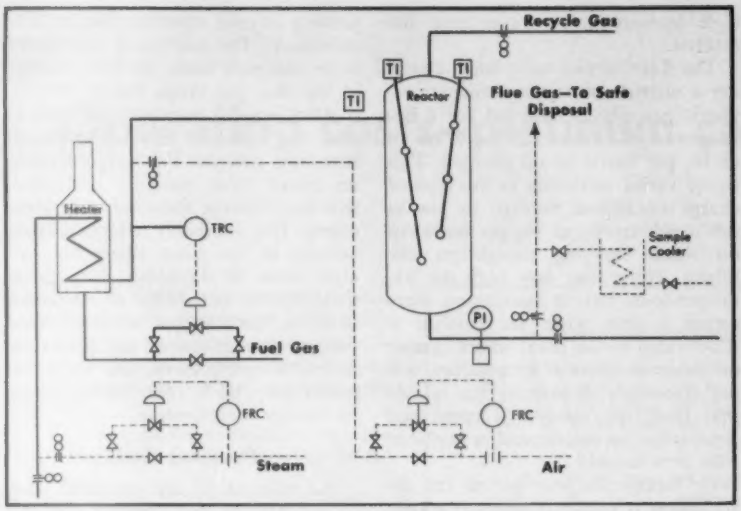
	Gas oil feed	Treated gas oil	% removal
Gravity, °API	26.4	27.1	..
Sulfur, wt. %	0.70	0.17	76
Nitrogen, wt. %	0.17	0.13	24
Carbon residue, wt. %	0.73	0.37	49
Viscosity, S.s.U. at 100° F.	100.0	176.0	..
Viscosity, S.s.U. at 210° F.	45.6	44.0	..
UOP K	11.96	11.98	..
Cu, p.p.m.	0.005	0.018	(?)
Ni, p.p.m.	0.51	0.07	86
V, p.p.m.	1.17	0.07	94
Pb, p.p.m.	0.021	0.010	52

Operating at volume hourly space velocity of 2.4, and H_2/oil ratio of 2,420 std. cu. ft. per bbl. charge, and reactor charge at 700° F.

Catalyst age—5.73 bbl. of oil per pound of catalyst.

TABLE 3—EXPECTED RESULTS FROM CATALYTIC CRACKING OF HYDROGENATED GAS OILS
(Data obtained from pilot-plant correlations)

	Before	After
Hydrodesulfurizing:		
Liq. vol. %	100	101.5
Gravity ° API	21.6	23.0
ASTM distillation, ° F.:		
1.b.p.	434	350
5%	620	...
10%	658	...
30%	714	690
Sulfur, wt. %	0.83	0.17
Nitrogen, wt. %	0.25	0.10
Bromine No.	1.6	0.50
Gasoline, 400° F. ep	0.0	3.5
Catalytic Cracking:		
C_5 – 400° F. gasoline vol. %	33	37
Conversion, vol. %	60	60
Carbon on catalyst, wt. % feed	7.0	4.8
Gasoline:		
Sulfur, wt. %	0.11	0.026
Octane:		
F-1 clear	96.0	96.8
F-1/3 ml.	98.3	100.0
Cycle Oil:		
Gravity, ° API	15.0	20.0
Aniline point, ° C.	43.0	50.0



CATALYST REGENERATION for gas-oil hydrodesulfurization unit. The cobalt-molybdenum catalyst is rugged, but over a period of time it will deactivate and must be replaced or regenerated. Steps in the in situ regeneration are reviewed in the text of this article. Fig. 3.

TABLE 4—PRODUCT YIELDS AND QUALITIES BEFORE AND AFTER HYDRODESULFURIZATION OF CAT CRACKER CHARGE
(Commercial data)

	Fluid cat cracking unit		
	Charge desulfurized	Charge not desulfurized	Difference
Barrels per stream day:			
Hydrodesulfurizer charge	3,914	0	....
Desulfurized gas oil	3,900	0	....
Total gas-oil cracking stock	7,105	7,119	....
Fluid cat cracking unit conversion	71.59	71.53	0.06
Fluid cat cracking unit yields:			
Hvy. cat cycle oil (vol. % fluid cat crack. unit charge)	5.44	4.97	0.47
Light cat cycle oil (vol. % fluid cat crack. unit charge)	22.97	23.50	—0.53
Cat naphtha (vol. % fluid cat cracking unit charge)	52.88	52.45	0.43
6-lb. R.v.p. cat naphtha (vol. % fluid cat cracking unit charge)	51.74	51.77	—0.03
Poly feed (vol. % fluid cat cracking unit charge)	17.17	16.54	0.63
Fuel gas (C_2 and lighter) (std. cu. ft./bbl. fluid cat cracking unit charge)	298.0	322.0	—24.00
Total fuel gas (std. cu. ft./bbl. fluid cat cracking unit charge)	348.0	374.0	—26.00
Coke (lb./bbl. fluid cat cracking unit charge)	27.9	28.5	—0.60
Over-all liquid product yields (vol. % fluid cat cracking unit charge):			
Hydrodesulfurizer gasoline	1.41	0	1.41
Fluid cat cracking unit cat naphtha	52.88	52.45	0.43
Poly gasoline	9.16	8.52	0.64
2-lb. R.v.p. poly gasoline	(8.29)	(7.70)	(0.59)
Total gasoline	63.45	60.97	2.48
LPG	5.67	5.69	—0.02
Fluid cat cracking unit charge and product qualities:			
Fluid cat cracking unit raw oil:			
Conradson carbon residue	0.26	0.31	—0.05
°API	28.6	28.1	0.50
Per cent off 675° F.	39.0	37.0	2.00
Cat naphtha:			
R.v.p.	7.1	6.7	0.40
End point	429.0	440.0	—11.00
RON (clear)	92.3	92.4	—0.10
+3 cc.	98.4	98.3	0.10
Poly gasoline:			
R.v.p.	8.1	8.3	—0.20
RON (clear)	97.1	97.2	—0.10

commercial yield and product-quality data obtained by cat cracking hydrogenated gas oils.

Less coke . . . There is definite proof that less coke is now being formed in the fluid catalytic cracker. This is apparent by reduced air blower rates to the regenerator at comparable cat cracker feed rates and conversion levels. To someone having a cat cracker limited by air-blower capacity, this would permit either higher conversions or higher charge rates to the unit. Kerr-McGee's blower is oversized so that no economic advantages can be claimed due to this.

Lower regenerator temperature . . . A considerable drop in the regenerator temperature (as much as 40° F.) has been noticed which is probably due to lower coke production. The cat cracker is a heat-balanced unit (one without a feed preheater) so these changes are easy to observe. Lower regenerator temperatures are desirable since they prolong the life of the cyclones and other regenerator internals as well as result in reduced deactivation of the fluid catalyst due to sintering at high temperatures. Both of these items are real economies.

Octane increase? . . . It is doubtful that any octane increase on the cat naphtha has been realized. The catalytic cracker has been operating at reduced conversions over most of the period that the distillate hydrodesulfurization unit has been on stream. Reduced cat cracker conversions normally cause a reduction in the octanes of the cat naphtha. However, the data in Table 4, which were obtained recently at higher conversions, show essentially no change in the cat naphtha octanes before and after hydrogenation of the cat charge stock.

It is well to note that the commercial data from Kerr-McGee's hydrogenation unit do not show nitrogen removal to be as great as the pilot-

TABLE 5
ESTIMATE OF OPERATING COSTS AT KERR-McGEE FOR 4,000 BPCD GAS OIL AND DISTILLATE HYDRODESULFURIZATION UNIT

Item	Cost cents per barrel charge
Catalyst (50 bbl./lb. estm. total life)	2.1
Chemicals	Negligible
Utilities	1.3
Royalties	1.5
Maintenance (6% per year of investment)	3.3
Depreciation (10% per year of investment)	5.5
Operating labor (½ man per shift @ $3.00/hr.)	0.9
	14.6

plant correlations would indicate. Theoretically this tends to reduce the octane gain. Therefore, unless another catalyst or different operating conditions increase nitrogen removal, the octane boost, if any, on our cat naphtha will probably be small.

Cat naphtha yields . . . The data observed in the cat naphtha yields (after adjustment for Reid vapor pressure) indicate that no increase is being realized. The treater itself produces a sour, high - vapor - pressure naphtha which is removed from the stripper as an overhead product. Part of this material is probably recovered due to better fractionation in the stripper than in the crude tower. However, since the initial boiling point of the charge to the treater is in the neighborhood of 370° to 400° F., the major portion of this naphtha is a result of hydrocracking.

The naphtha yield is approximately 2.5% based on the treater charge, and ultimately is processed to finished gasoline after being charged along with crude oil to the crude unit. In estimating total gasoline-yield advantage, a credit for this gasoline fraction must be taken.

There appears to be less gas make from a hydrogenated charge stock and an over-all improvement in recovery of poly feed. This results in higher yields of polymer gasoline at the expense of ethane and lighter.

A comparison of "X" grade burning oils (which contains light catalytic cycle oil) produced before and after hydrogenation shows an improvement in the quality of this fuel. This is due primarily to the reduced sulfur content and carbon residue of the light catalytic cycle oil produced from hydrogenated cat charge stock.

The Catalyst

Of course, these advantages are not obtained without paying for them. Depreciation of equipment, catalyst costs, royalties, and maintenance expenses make up the major portion of the distillate hydrodesulfurization unit's operating costs. The catalyst and catalyst costs are worthy of some discussion.

Rugged catalyst, but it deactivates . . . The cobalt-molybdenum desulfurization catalyst is rugged. It is resistant to metal poisoning, breakage, and shattering due to pressure drop across the bed, and to sulfur poisoning. However, over a period of time, this catalyst will deactivate due to the formation of coke on the catalyst as a byproduct of the hydrodesulfurization reactions. This rate of deactivation can be retarded by maintaining a high hydrogen-to-oil ratio over the catalyst.

The Kerr-McGee unit, when charging a mixture of vacuum and atmospheric gas oils, is designed for a hydrogen-to-oil ratio of 2,500 std. cu. ft. of H_2 per barrel of oil charged. This figure varies according to the type of charge stock, and may go as low as 1,500 std. cu. ft. of H_2 per barrel of oil when charging straightrun distillates. No matter how high the hydrogen-to-oil ratio is maintained, there comes a time when the catalyst is deactivated to the point where further increases in reactor temperature will not effectively desulfurize the oil. At that time, the catalyst is spent and must either be regenerated or replaced with new catalyst.

On heavy oils, the period for deactivation is relatively short. To keep down new-catalyst cost, this unit has been equipped with facilities for regeneration of catalyst in situ.

Regeneration procedure . . . The flow diagram of the regeneration scheme is shown in Fig. 3. It should be noted that at the time of writing the catalyst in this unit has not been regenerated, since it is still possible to desulfurize without exceeding design limits of the reactor charge heater. The regeneration procedure given below was obtained from the experience of other refiners, and will be followed during the first regeneration at Wynnewood. The steps in regeneration are:

1. The oil is cut out of the unit and hydrogen recycle is continued for 2 hours to remove excessive oil from the catalyst and system.

2. The recycling of gas is stopped, the unit depressured, and purged with nitrogen. Blinds are swung so as to isolate the reactor and heater from the rest of the unit.

3. Steam is passed through the heater and into the reactor at 900° F. This is continued until no traces of oil are obtained by condensation of the steam leaving the reactor. This step may take several days, depending upon the steam available.

4. After steaming of the reactor is complete, the steam temperature is reduced to 700° F. Air is admitted to the reactor so that 1 to 1.5% oxygen is present in the steam-air mixture. It is important that the amount of air be regulated closely. Bed temperatures must not exceed 1,100° F. since high temperatures will damage the catalyst, and in some cases distill the molybdenum as a compound from the catalyst pellets onto the reactor walls.

5. The inlet steam temperature is raised from 700° F. by increments of 100° F., up to 900°-975° F. while holding oxygen concentration at 2% maximum. The reaction is considered to be complete when the CO_2 content in the flue gas drops below 2%.

After several regenerations such as this, the catalyst must be replaced with new catalyst. Each regeneration, no matter how carefully controlled, will heat damage the catalyst to some extent. This ultimately reduces catalyst activity to the point where the catalyst must be discarded. No one is quite certain as to what effect metals have on the catalyst activity. Some people consider sodium and potassium to be catalyst poisons, and these elements may be a contributing factor to catalyst deactivation.

Operating Costs

An estimate of the operating costs of a 4,000-bbl. per calendar day gas-oil hydrodesulfurization unit is shown in Table 5. These costs are self-explanatory for the most part. It should be pointed out that maintenance costs have been higher than shown. This was due to the normal mechanical problems experienced on the startup of any new unit. It is expected that maintenance costs will be equal to or less than the figure shown now that the unit has been broken in. The catalyst cost is based on an expected total catalyst life of 50 bbl. of oil charged per pound of catalyst.

Economics of Gas-Oil Hydrodesulfurization

These yield data and operating cost data, along with appropriate product values, indicate that hydrogenation of cat cracker charge stock is not an extremely profitable operation at Wynnewood. Our economics indicate that it is doubtful whether a refiner would install a unit such as this for the sole purpose of hydrogenating cat cracker charge stock, even though some profit is realized by this operation. However, the most important factor to consider is the flexibility with regard to product-quality improvement that can be obtained by the installation of a hydrodesulfurizer.

The unit at Wynnewood is designed so that higher-quality distillate fuels may be produced as soon as market conditions require that this be done. There is also the possibility that a good profit can be obtained by marketing at this time a burner fuel superior in quality to the fuel currently being produced. This possibility is being studied.

Acknowledgment

The author expresses appreciation to his associate, Jack Maness, who contributed much to the preparation of this article.

Operating costs—platinum catalyst reforming

BY W. L. NELSON
Technical Editor and Petroleum Consultant

ALTHOUGH regenerative systems are thought to increase catalyst life, such operation costs more, with the final operating cost being scarcely different for the two types of operation.

Capacity has little effect on operating cost, being somewhat as follows:

	Total (cents/bbl.*)
2,000 B/D	50.5-70.0
5,000 B/D	46.2-61.2
10,000 B/D	44.6-56.2
20,000 B/D	44.1-54.9

*Includes obsolescence, taxes, insurance, interest, etc.

The literature report costs ranging from 19.5 to 50.7 cents per barrel, averaging 34.5 cents, but not all costs are included in most of the values reported in the literature.

Many references credit the gas production in the operating cost but the value of the gas should properly be considered as part of the value of the products.

TENTATIVE SCHEDULE OF PROCESS COSTIMATING

Sept. 28, 1959—No. 57 Complexity versus Manpower.
Oct. 12, 1959—No. 58 Processing Changes Since 1861.
Oct. 26, 1959—No. 59 Operating Cost—Alkylation.
Nov. 9, 1959—No. 60 Estimating or Checking the Plant Staff.
Nov. 23, 1959—No. 61 Operating Cost—Polymerization.
Dec. 7, 1959—No. 62 Chemicals Used in Refining.
Dec. 21, 1959—No. 63 Operating Cost—Catalytic Cracking.
Early 1960—No. 64 Indication of Chemical Consumption.
Early 1960—No. 65 Oil-Company Employes.
Early 1960—No. 66 Prices of Chemicals.

References

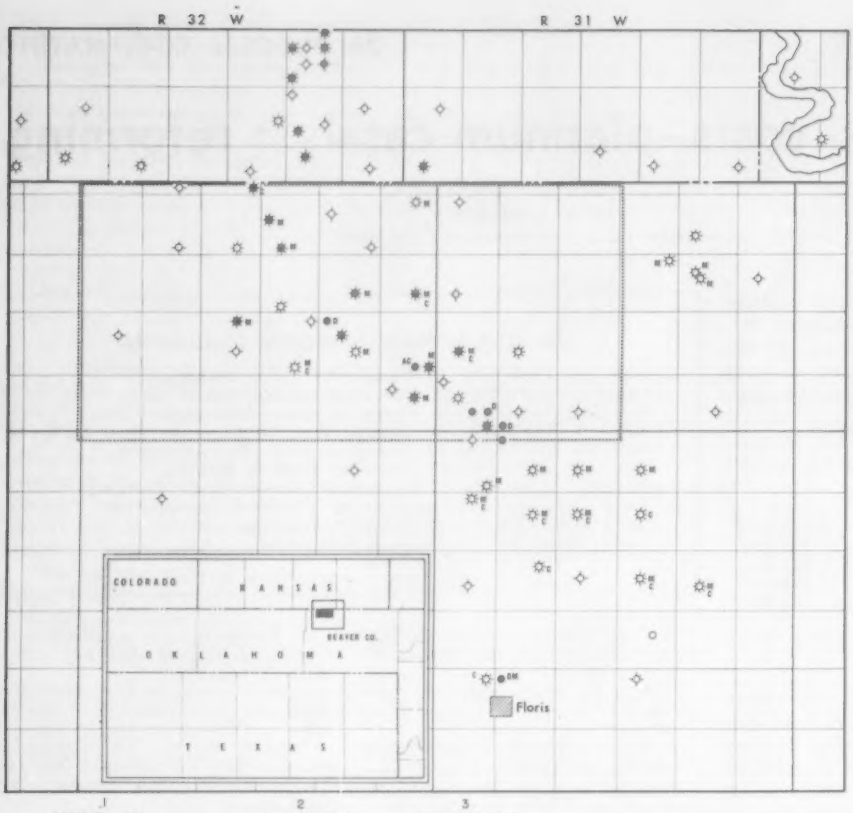
1. Anon. (Kellogg), Catalytic Reforming and Feed Desulfurization, The Oil and Gas Journal, March 19, 1956, p. 159.
2. Anon., Estimating Requirements for Process Steam and Water, Chem. Engineering, April 1951, p. 110.
3. Anon., Case for Upgrading Natural Gasoline, Pet. Refiner, July 1957, p. 187.
4. Author's files.
5. Berg, C., First Commercial Hyperformer, The Oil and Gas Journal, August 2, 1954, p. 91.
6. Bland, William F., Platforming, Pet. Processing, April 1950, p. 351.
7. Eckhouse, J. G., Platforming, Pet. Engineer, April 1954, p. C-26.
8. Egloff, G., Ind. Eng. Chem., 47, No. 5, p. 990 (May 1955).
9. Fowle et al., Pet. Refiner, 31, No. 4, p. 156 (1952).
10. Fulton, F. W., Pet. Refiner, 29, No. 12, p. 109 (1950).
11. Grote et al., Pet. Refiner, 34, No. 4, p. 116 (April 1955).
12. Gumaer & Raiford, How First Ultraformer . . ., The Oil and Gas Journal, August 8, 1955, p. 119.
13. Haensel, V., Platforming, Pet. Engineer, April 1950, p. C-9.
14. Kastens & Sutherland, Platinum Reforming of Gasoline, Ind. Eng. Chem., April 1950, p. 582.
15. Noll, Burtis & Dart, How Feed Stock and Severity Afford Houdriforming . . ., Pet. Refiner, May 1953, p. 113.
16. Noll, H. M., Ref. Construction Manual, Part 7, Mechanical Eng. and Design, Ref. Engineer, February 1959, p. C-10.
17. Nelson, W. L., Petroleum Refinery Engineering, fourth edition, McGraw-Hill Book Co., New York, 1958.
18. Seebold et al., Pet. Refiner, No. 5, 114 (1952).
19. Thornton, D. P., How a Small Plant Makes Octanes, Pet. Processing, August 1953, p. 1139.
20. Tyson, Gornowski and Nicholson, Pet. Refiner, 33, No. 5, 163 (1954).
21. Williams and Sutherland, Production of Aromatics from Nat. Gas Liquids, The Oil and Gas Journal, August 9, 1951, p. 84.

TABLE 1—ELEMENTS OF OPERATING COSTS FOR PLATINUM CATALYST REFORMING

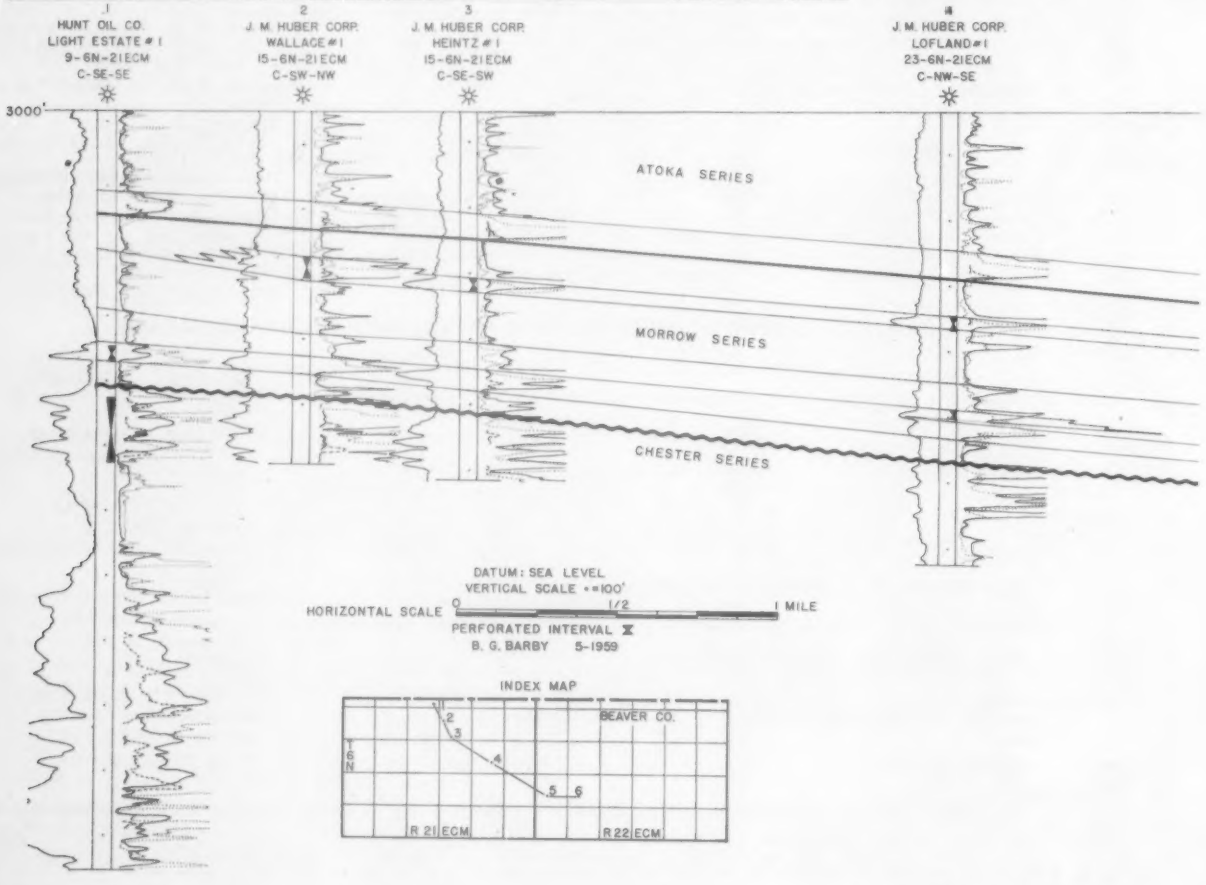
Element—	Unit (somewhat standard)	1956 unit cost	For 5,000-B/D plant cents/bbl.)	See Process Costimating No.
Labor:				
Supervision	0.4-0.75 men/shift*	$3.85/hour†	0.74-1.38*	26, 28, 41, 42
Operating	2.0-5.0 men/shift*	$3.12/hour†	3.00-7.50*	
Maintenance	3-5%/year of replacement	$450-$750/daily bbl.	4.10-6.85	29
Fuel	340-400 M. B.t.u./bbl.	20-40 cents/M.M. B.t.u.	6.80-16.0	3, 4, 6, 30
Steam	10-127 (use 60) lb./bbl.	45-60 cents/M. lb.	2.70-3.60	17, 18, 31
Water	700-1,420 gal./bbl.	1.7 cents/M. gal.	1.19-2.42	15, 38
Electricity	0.8-4.4 kw.-hr./bbl.	0.86 cents/kw.-hr.	0.69-3.78	13, 14, 21-23, 26
Direct operating cost excluding catalyst (probable extremes)			24-37	
Catalyst	50-100 bbl./lb.	$4.00/lb. replacement.	4-8	
Direct operating cost (probable extremes)			29-44	
Laboratory	0.6 men/shift	$3.12/hour†	0.9	26, 28, 41, 42
Obsolescence, insurance, taxes, interest (7.5% per year of replacement)			10.3	
Royalty		3-7 cents/bbl.	6.0	7
Other charges			17.2	

*Independent operators use the smaller number of men and major operators the larger. †Average U. S. wages plus 27% of all burdens.

Reserves Light



LIGHT FIELD, located in northwest Beaver County, Oklahoma, (see inset) is producing gas from several wells in the Purdy and Mocane sands of the Morrow series. Fig. 1.



Study of Morrow Sand Field, Oklahoma

Gas reserves in the Morrow sand of northwest Oklahoma can best be calculated by use of decline curves. The author believes that accurate results can be obtained in porous sections, but warns—"watch those curves from low-permeability areas."

BY B. G. BARBY

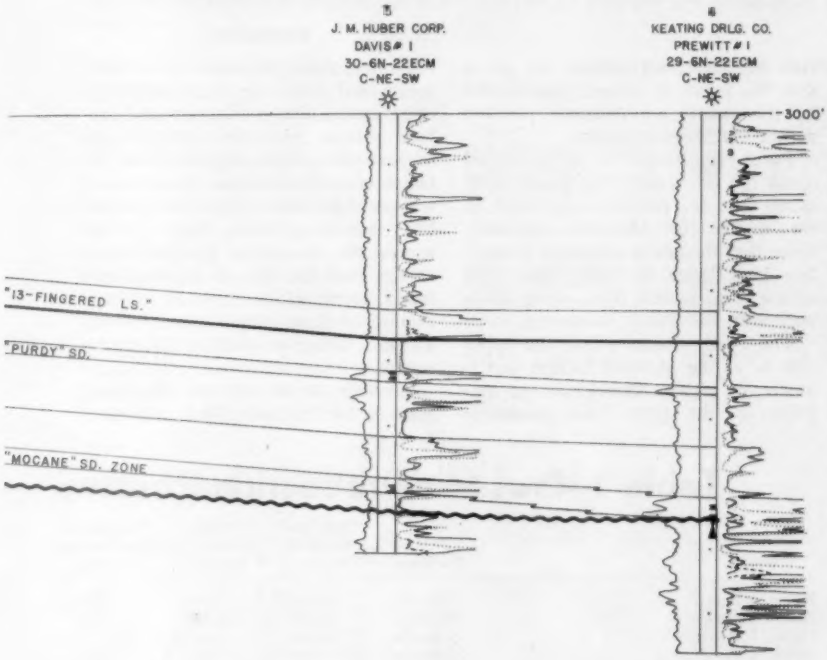
. . . consulting geologist in Oklahoma City, specializing in subsurface problems of northwestern Oklahoma, an area which has held his attention for the past 5 years. He is a partner in the firm of Kilgore-Barby, publishers of a semiannual gas report on the State of Oklahoma listing 12,000 individual wells. A graduate of University of Oklahoma holding an MS degree in petroleum geology, he was an exploration geologist with Standard Oil Co. of Texas until 1957.

FOR THE past 10 years, operators have been probing the Morrow series of northwestern Oklahoma in search of oil and gas, and have found large quantities of both.

Major discoveries in this area have been gas producers with some associated oil or condensate. Most of these wells were shut in awaiting pipeline connections until 1958. At this time, Colorado Interstate Gas Co. pioneered a new major network of transmission lines through Cimarron, Texas, Beaver, and Harper counties.

Until the shut-in wells were connected, no production history was available, and operators were forced to depend on electrical-log analysis and core data to calculate reserves for the area. As a result, only rough estimates of actual reserves could be made due to unknown lateral variations in productive thickness and porosities.

Time factor important . . . Approaching lease-expiration dates in the past few years have forced operators to drill many wells without sufficient economic data to justify drilling. Some have elected to farm out, believing that Morrow reservoirs would not prove to be continuous and consequently would have poor recoveries in spite of large initial potentials.



CROSS-SECTION through Light field. The Purdy zone occurs sporadically over a large portion of the Oklahoma Panhandle. Because of its lack of continuity, it is known locally by a variety of names. Fig. 2.

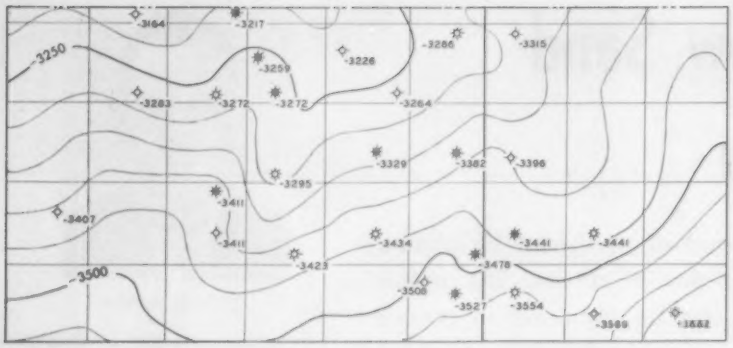
Light field, producing primarily from the Morrow, did secure an early pipeline connection. It is located in northwestern Beaver County. This field has several productive zones in the Pennsylvanian and Mississippian Systems. The first gas withdrawals were in December 1951, with Panhandle Eastern Pipe Line Co. as the purchaser. They have proven to be a purchaser with a large appetite for gas, and have now withdrawn the bulk of the gas from the field.

Purpose of study . . . This study of Light field was undertaken to determine the productivity of the Morrow so that the results could be applied to similar areas.

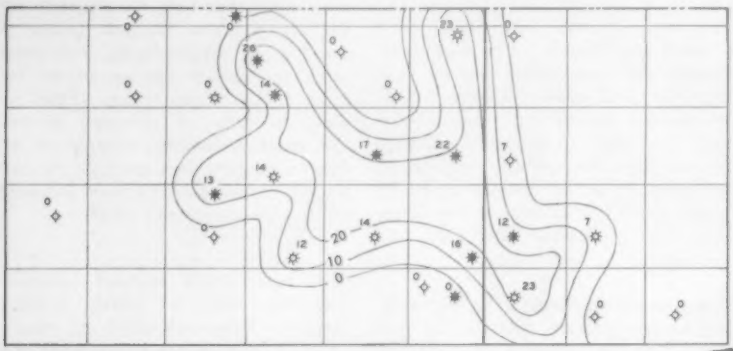
All wells failing to penetrate the Morrow were excluded from this study and all dually completed wells were separated to show only production from the single continuous Morrow sandstone underlying the field. Thus all data and maps can be considered to show the geology and productive history of a single Morrow sandstone, which is the most prolific zone in the field.

Geology

Rocks assigned to the Morrow series are the lowermost Pennsylvanian strata represented in this area. They



STRUCTURE CONTOUR map on the base of the Purdy. Contour interval = 50 ft. Fig. 3.



ISOPACH MAP of the Purdy, showing net productive thickness. Interval = 10 ft. Fig. 4.

underlie the "13-fingered limestone" at the base of the Atoka series and rest unconformably on the surface of the Chester series. The thickness of the Morrow ranges from 351 ft. to 260 ft., and it thins generally in a northeastward direction.

The Morrow shales are dark gray to black, carbonaceous, pyritic, and blocky to fissile. Limestones are erratic and discontinuous, and are gray to buff to brown, microcrystalline to coarsely crystalline, siliceous, and glauconitic. The standstones are gray to clear to tan, fine to coarse-grained to conglomeratic, generally poorly sorted, subangular to subrounded, glauconitic, quartzitic, pyritic, and have a calcareous cement.

Two separate sandstones are present in the Morrow section of the area included in the study. These are shown in Fig. 2 and the upper will be referred to as the Purdy sandstone and the lower as the Mocane sandstone. The Purdy occurs sporadically over a large area of the Panhandle region, and is not a continuous sandstone. For this reason the unit has been given a variety of names, including upper Morrow sand, Sturgis sand, Kelly sand, Bowles sand, and Lips sand.

Correlations across areas where the sandstone is locally absent are difficult. However, correlations do prove that this variously named zone occurs in the same approximate position within the Morrow section.

Purdy sandstone is the preferred name for this zone! The lower sandstone unit is probably equivalent to the middle or Mocane sandstone. Since the Mocane is of minor productive importance in Light field with erratic distribution, this study deals only with the Purdy sandstone.

The Purdy occurs within the upper 100 ft. of the Morrow section and is uniformly present throughout the majority of the field. This sandstone body has an areal extent of 16 sq. miles and ranges up to 30 ft. in total thickness.

A structure map on the base of the Purdy shows that sandstone deposition was influenced by structural variations at the time of deposition, Fig. 3. The distribution pattern suggests offshore current deposition with the sandstone being laid down adjacent to structural noses, accentuating the presence of small synclines with increased thickness. Possibly a current moving in a southward direction dropped its heavier load in the lee of the nose in Section 14-6n-21eCM.

The Purdy sandstone lens created a primary stratigraphic trap, being completely enclosed in impermeable shales and terminating abruptly updip. A gas-condensate pool was formed which completely filled the porous part of this sandstone lens. Since no fairways existed for distant migration of hydrocarbons into the trap, it is assumed that the source of the gas-condensate was the surrounding carbonaceous shales.

An isopachous map of the net productive interval of the Purdy shows that most of the total interval is productive, Fig. 4. It also shows that the porous interval map conforms with the total thickness isopach.

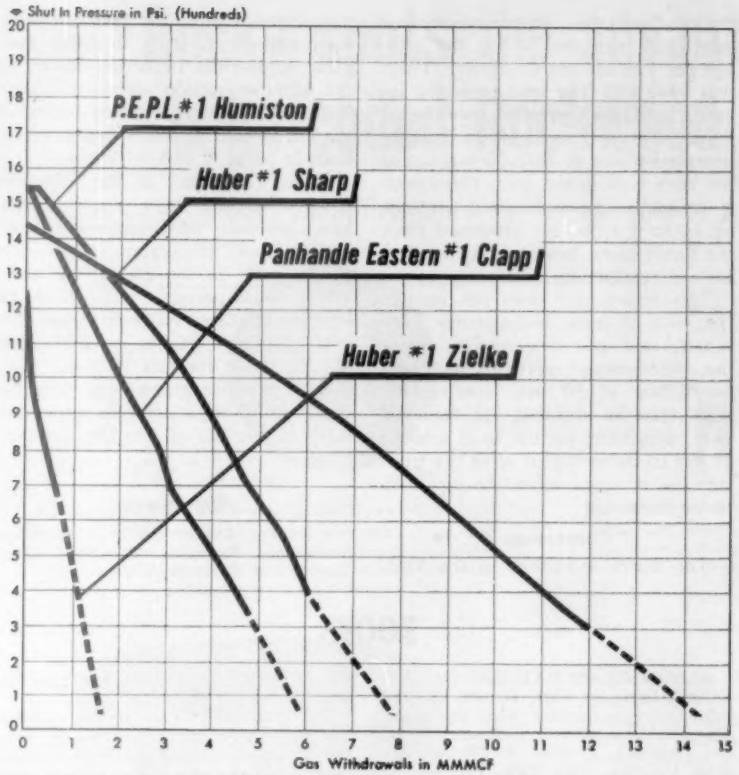
Production

Graphs were prepared on 12 wells in the field producing from the Purdy, using cumulative production and surface shut-in pressures compiled by Kilgore-Barby Gas Reports from the Oklahoma Corporation Commission records. On these production graphs, the shut-in pressure was plotted against the cumulative gas production at the date the shut-in pressure was taken. Some of the data used in preparation of these graphs are shown in Table 1 listing production history by wells.

Average depth of the producing zone in the field is 6,100 ft. and most

Table 1—Pressure-Production-Reserve

Well—	Location	Cum. prod. to 4-1-59 M.M.c.f.	Reserves as of 4-1-59 M.M.c.f.	Total rec. to abandonment M.M.c.f.
Huber 1 Sharp	13-6n-21e	12,046	2,204	14,250
Huber 1 Heintz	15-6n-21e	8,470	2,380	10,850
Huber 1 Wallace	15-6n-21e	14,404	3,146	17,550
Huber 1 Hinz	22-6n-21e	934	516	1,450
Huber 1 Lofland	23-6n-21e	1,780	1,120	2,900
Huber 1 Clapp	24-6n-21e	2,291	559	2,850
P.E.P.L. 1 Clapp	25-6n-21e	4,747	1,203	5,950
Huber 1 Potter	26-6n-21e	789	461	1,250
Huber 1 Stephenson	27-6n-21e	335	615	950
Huber 1 Zielke	28-6n-21e	676	1,124	1,800
Huber 1 Davis	30-6n-22e	4,448	1,802	6,250
P.E.P.L. 1 Humiston	31-6n-22e	6,047	1,403	7,450
Total		56,967	16,533	73,500
Average		4,747	1,378	6,125



PRESSURE-PRODUCTION HISTORY for four wells having different productive characteristics. **Fig. 5.**

wells were completed with a minimum of treatment. A few wells were fractured, but most were completed natural.

The potential test chart shows the results of one-point open-flow potential tests required by the Corporation Commission during the year 1954 when most of the wells were connected, Table 2. Average daily potential at this date was 35 M.M.c.f. for the 12 wells, and the average gas gravity was 0.683. Initially, some of the better wells had higher estimated potentials, but this was the first field-wide test and offers a better comparison among individual wells at the date when most wells were connected to a pipeline. The last well to be connected received a connection in January 1955.

TABLE 2—POTENTIAL TESTS, PURDY ZONE, LIGHT FIELD

Well	Location	Date of test	Perf. interval tested in ft.	Gas gravity	Potential M.M.c.f.	% Porosity Schlumberger
Huber 1 Sharp	13-6n-21e	4-54	5,977-6,001	0.693	72.9	20
Huber 1 Heintz	15-6n-21e	4-54	6,009-6,028	0.675	37.1	17
Huber 1 Wallace	15-6n-21e	4-54	5,974-6,005	0.669	44.7	15
Huber 1 Hinz	22-6n-21e	4-54	6,031-6,048	0.685	3.0	15
Huber 1 Lofland	23-6n-21e	12-53	6,048-6,058	0.683	11.6	16
Huber 1 Clapp	24-6n-21e	11-54	6,061-6,098	0.692	66.9	17
P.E.P.L. 1 Clapp	25-6n-21e	6-54	6,181-6,199	0.695	47.5	17
Huber 1 Potter	26-6n-21e	4-54	6,156-6,176	0.674	5.6	15
Huber 1 Stephenson	27-6n-21e	4-54	6,168-6,336	0.662	1.4	17
Huber 1 Zielke	28-6n-21e	10-54	6,140-6,156	0.694	3.0	17
Huber 1 Davis	30-6n-22e	9-54	6,117-6,129	0.694	48.0	15
P.E.P.L. 1 Humiston	31-6n-22e	8-54	6,240-6,276	0.685	79.0	17
Total				8.201	420.7	398
Average				0.683	35.0	16.5

Data, Purdy Zone, Light Field

Surface shut-in pressure, by years, psig.					Cum. prod. at date of shut-in pressure			
Initial	1956	1957	1958	1959	1956	1957	1958	4-1-59
1,458	634	514	357	296	9,033	10,198	11,442	12,046
1,481	708	620	383	332	6,311	7,088	8,046	8,470
1,475	695	563	365	352	10,351	11,754	13,745	14,404
1,430	735	620	427	352	480	586	824	934
1,032	727	604	411	340	603	1,041	1,526	1,780
1,520	585	424	265	244	1,346	1,779	2,153	2,291
1,551	829	695	507	337	2,765	3,121	4,037	4,747
1,101	758	574	418	340	290	435	677	789
1,421	1,085	1,006	875	721	74	102	231	335
1,259	1,059	929	766	676	115	263	471	676
1,554	1,241	959	687	457	1,239	2,231	3,457	4,448
1,550	843	728	554	379	4,171	4,641	5,454	6,047
16,832	9,899	8,236	6,015	4,799	36,778	43,239	52,063	56,967
1,403	825	686	501	400	3,065	3,603	4,339	4,747

Wet gas . . . Most of these wells are very rich in condensate, and while cumulative condensate production is not available by zones for every well, the Panhandle Eastern Pipe Line 1 Humiston had produced 12,826 bbl. to January 1, 1959. Generally, the lowest structural portion of the trap has produced the most condensate, as could be expected.

Early decline misleading . . . A few of the more representative production vs. pressure graphs are shown in Fig. 5. Most wells exhibit a smooth straight-line decline curve, but a few wells have a definite curve which levels out as the shut-in pressure approaches zero. One of the best examples of this type of curve is found on the Huber 1 Zielke, 28-6n-21eCM. It was found that this was typical of wells which had lower initial potentials and porosities and for the most part had been fractured upon completion. It is assumed that the induced permeability caused by fracturing allowed gas to be withdrawn faster immediately around the well bore. This created a local pressure drop which indicated lower reserves from an early reading on the graphs. As additional gas was withdrawn, a pressure differential was set up between the reservoir adjacent to the well bore and that part of the reservoir not influenced by treatment. Then gas started feeding more rapidly into the well bore, pushed by the higher pressures existing at the perimeter of the drainage area. In this case the drainage area is quite large, 640 acres per well.

Since most of the better wells did exhibit a straight-line decline curve, it would have been possible to make

a reasonably accurate reserve prediction early in the production history of the field. Only two points for a graph would have been necessary—the initial shut-in pressure and a shut-in pressure and cumulative-production point plotted when the second shut-in pressure was taken.

The leveling-out effect previously discussed would not have much effect on total reserve predictions, since it occurred on smaller wells which, even with increased later reserves, would change the over-all reserve picture very slightly. It was also concluded that no active water drive was present in the reservoir due to the straight-line decline curves.

Reserves determined . . . All the production vs. pressure graphs were extrapolated to show ultimate predicted gas recoveries at the time of reservoir depletion. These projections were based on the attitude of the production-pressure curve of each well. On the basis of these projections, the remaining gas reserves were calculated and the total ultimate recoveries were listed, Table 1. It was assumed that the shut-in pressure of the field would be reduced to 50 psi. before abandonment, but compressors would have to be installed before this pressure was reached. Therefore, the ultimate recoveries may be slightly lower or higher depending on the abandonment pressure.

The 12 wells had produced an average of 4,747 M.M.c.f. gas per well to April 1, 1959. On the basis of projected curves, the wells will produce an average of 6,125 M.M.c.f. before depletion. Therefore, 77.5% of the total recoverable gas has now been withdrawn from the reservoir. The fact that most of the gas has been withdrawn from the field already allows only a small margin of error for the projected remaining reserves. In addition, it shows an almost complete productive history of the Purdy sandstone which can be applied to other areas of Morrow production for reserve predictions.

There is a total of 123,710 acre-ft. of net productive section underlying the 12 wells producing from the Purdy. This zone is expected to contain a total of 73,500 M.M.c.f. of recoverable gas, Table 1. Therefore the recovery factor of the Purdy for this field will be 594 M.c.f. per acre-ft. The average porosity of the field calculated by Schlumberger from electrical logs was 16.5%.

Economics . . . Converting the present cumulative production and the total projected recoveries from the Purdy to dollars yields a figure that seems to represent a very favorable return from this area. Based on a rate of 20 cents per M.c.f., the average per well income to April 1, 1959, was $949,400. The total projected income, including present reserves, is $1,225,000 per well. If an average completion cost of $85,000 is assumed for each well in the area, these wells if drilled today would yield a return of 14 to 1 from gas produced from the Purdy alone, not counting condensate or production from other zones.

This return rate does not include the cost of lease maintenance, well repair, and gas compression. Since the abandonment pressure has been established at 50 psi., compression costs must be included, but they will vary, depending on the total amount of gas to be produced after the pressure has declined below the pipeline's lower limit.

Conclusions

The Purdy sandstone of the Morrow series is a prolific reservoir with high recoveries. It is doubtful that other sandstones occurring lower in the Morrow section within this area will equal the high recovery factor of the Purdy due to greater lateral variations in porosity and thickness.

Wells completed in the Morrow from zones with high porosities can have accurate total recoveries projected from production-pressure graphs early in the life of the well. While lower-porosity wells tend to have an increased recovery in late life over early projections, an allowance can be made for this increase. Production-pressure graphs can thus be concluded to show accurate recoveries early in the life of Morrow production.

References

1. Jordan, Louise (1957) "Subsurface Stratigraphic Names of Oklahoma," Okla. Geol. Survey, Guide Book VI, p. 160.

BOOKS

HANDBOOK OF NATURAL GAS ENGINEERING. By Katz, Donald L.; Cornell, David; Kobayishi, Riki; Poettmann, Fred H.; Vary, John A.; Elenbaas, Jack R.; and Weinaug, Charles F. McGraw-Hill Book Co., Inc., New York, 1959, $37.50.

A long-awaited handbook for students and graduate engineers alike. From the first chapter, on the introduction to the natural-gas industry, to the last, on conservation and government regulations, this book covers every phase of natural-gas engineering.

Both practical and theoretical topics are covered. Derivations and explanations of some engineering principles are included for the benefit of the student and the young engineer. Design procedures are covered in the later chapters, with quantitative data being given in chart and table form to provide a basis for design calculations.

Recent advances in the industry are covered. These include: turbulence factors for flow through porous media, and flow calculations involving integrated functions of compressibility factors and pressures.

The properties of natural gas, and reservoir rocks are thoroughly covered. A small portion of the book is dedicated to condensate and oil fields. The phase behavior of condensate systems is included.

Low-temperature processes, and the liquefaction of natural gas are covered along with the design and operation of underground storage projects.

Example problems are included to illustrate calculation methods.

This is an outstanding book of extreme importance to the engineer engaged in any phase of work dealing with natural gas, a volume that has been needed by the industry for several years.

THE IMPACT OF OFFSHORE OIL DEVELOPMENT ON ORANGE COUNTY BEACH COMMUNITIES. By Frederick P. Lyte and William S. Lund. Published by Stanford Research Institute, Menlo Park, Calif., for Wesley West and American Marine Exploration Co., Los Angeles. 112 pp.

This volume consists of a report on the effect offshore oil drilling can have on communities in the same area.

The major conclusion of the study is that development of offshore oil resources can be accomplished if presently available modern techniques and controls are used, without harm to coastal communities near such development.

The report discusses possible community problems associated with offshore oil development, and presents possible solutions to the problems.

SURVEY OF OILS. Published by Financial Post, 481 University Ave., Toronto 1. 252 pp. $4.

This reference book provides details on active oil and gas companies in Canada, and covers producing, refining, pipeline, exploration, and drilling organizations. It gives information on production, reserves, earnings, dividends, acreage interests, and management.

A special map section gives up-to-date views of important oil and gas fields, including newly-developed areas. The volume also provides an 8-year price range of oil and gas stock movements. A section listing inactive and defunct companies brings to over 2,500 the total number of companies covered.

THE EARTH BENEATH THE SEA. By Francis P. Shepard. Published by Johns-Hopkins Press, Homewood, Baltimore 18. 275 pp. $5.

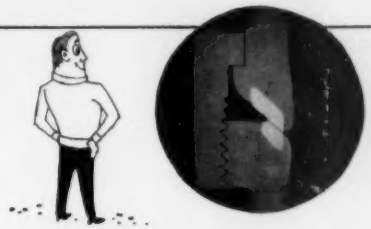
This well-illustrated and clearly presented book will appeal to nontechnical and scientific readers alike. Submarine or marine geology is a stimulating subject. Adventures of professional divers have always provided interest—the sea floor is a moving stage of action.

Recently an increasingly popular hobby is the amateur sport of skin-diving and aqualung exploring. What is the intrigue in oceanography? Submarine canyons, underwater mountain ranges, beach currents, swashes, storm tides, undertow, and internal waves are discussed, among other topics, in a stimulating manner. This volume will rouse adventure pangs in its readers.

Rocky spots the advantages of color-coded Rockwood Unions

Color-coding makes identification easy for warehouse personnel and pipe fitters

Nut-Gray — 2 Silicon Bronze Seats (Type 601):
These seats prevent corrosive action, electrolytic action, and dezincification of seat joint. Silicon bronze withstands much higher temperatures than ordinary bronze or brass — *perfect for chemical, steel, rubber, paper, and textile industries.*



Nut-Black — 2 Stainless Steel Seats (Type 602):
For use with *carbon steel pipe* and where there are severe temperature or acid conditions — but where an all stainless steel installation isn't necessary.

Nut-Olive Drab — Moly Steel Seats (Type 603):
Provides Hardness Differential and offers extra strength and resistance against corrosion. Male seat specially heat treated for 150 Brinell greater hardness than female seat.

Nut-Gray — Moly to Silicon Bronze Seats (Type 604):
Combines advantages of Types 601 and 603. Specially adaptable for shipboard use.

You get all these advantages too—

All parts are completely interchangeable. Rockwood Cold Forged Steel Unions will not gall in "making up" because the male seat is 150 Brinell harder than the female seat. This is the Hardness Differential you *need* in replacement and new work.

Rockwood Unions meet all general piping requirements. They are highly corrosion-resistant and are sold off standard Black Steel price list. Packed in cartons for palletizing. All Unions are tested and listed by Underwriters' Laboratories, Inc. Write for complete information today.

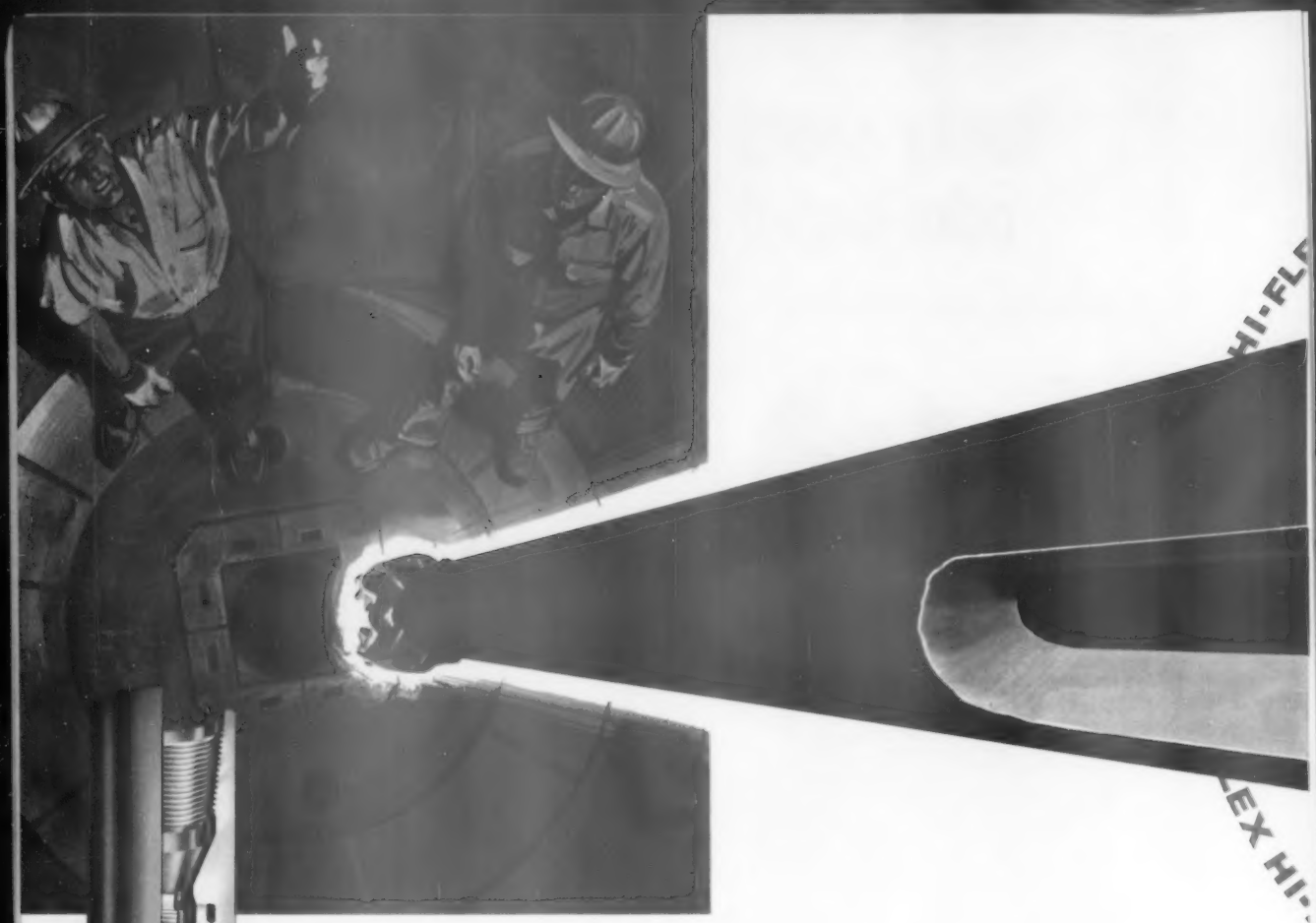
ROCKWOOD SPRINKLER COMPANY

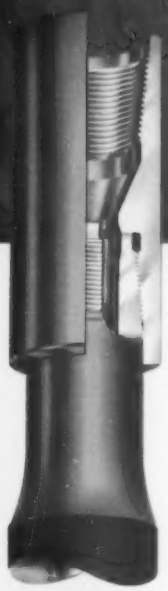
Distributors in all principal industrial areas

ROCKWOOD SPRINKLER COMPANY
742 Harlow Street
Worcester 5, Massachusetts

Please send me further information on Rockwood Unions.

Name .....
Title .....
Company .....
City .....
Zone ..... *State* .....





The Reed HI-FLEX treatment prevents fatigue cracks and increases the life of drill collars. This treatment work hardens the surface of the steel. It places the skin of the metal under compression so that it can withstand the stress reversals that cause fatigue cracks. HI-FLEX is an exclusive REED process that gives better distribution of the stresses and better control of the stressed skin than any other known process.

Call the Reed man in your area and let him give you the full story on REED HI-FLEX Drill Collars —and the complete line of REED quality products.

REED

DRILL COLLARS

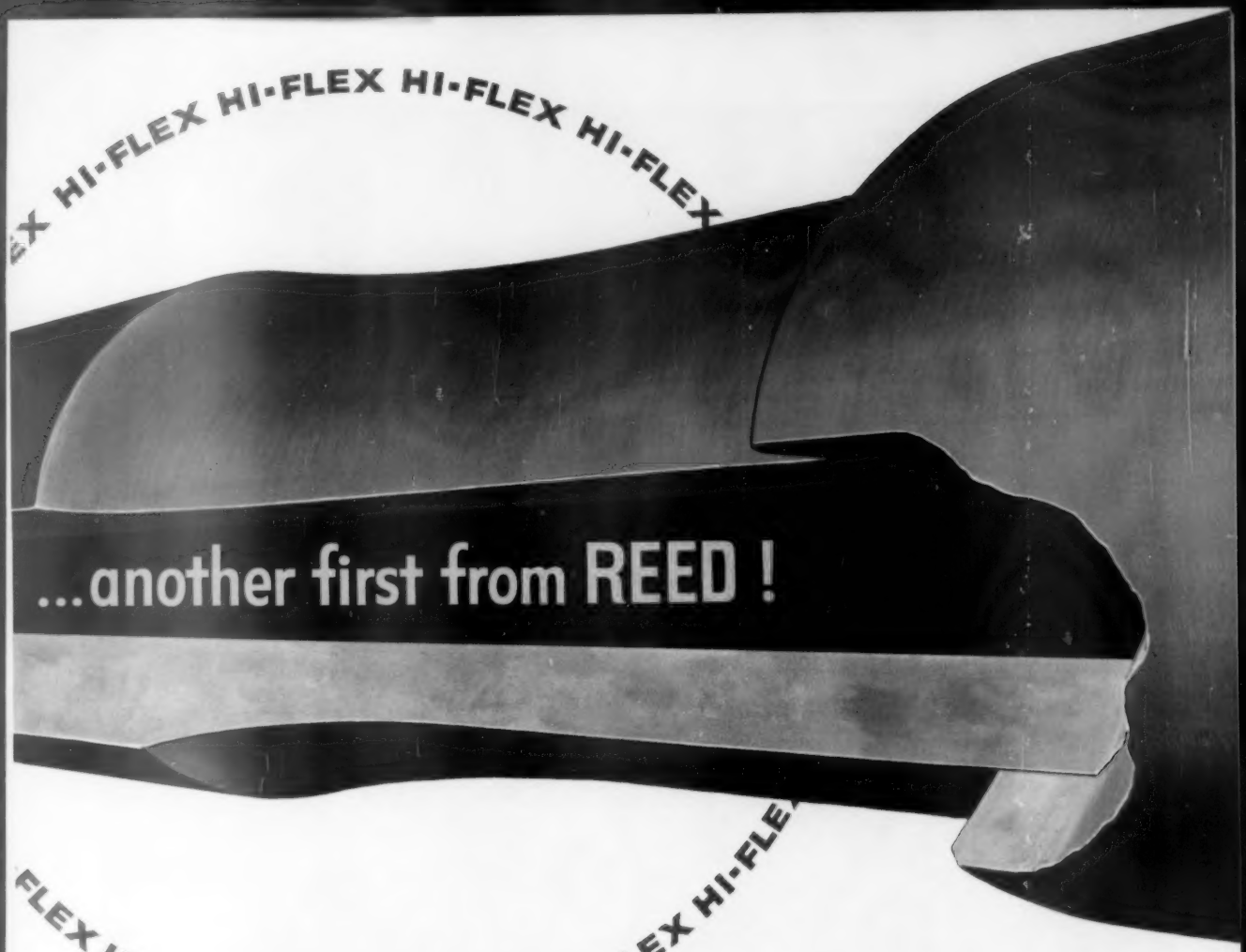
REED ROLLER BIT COMPANY

Houston 1, Texas

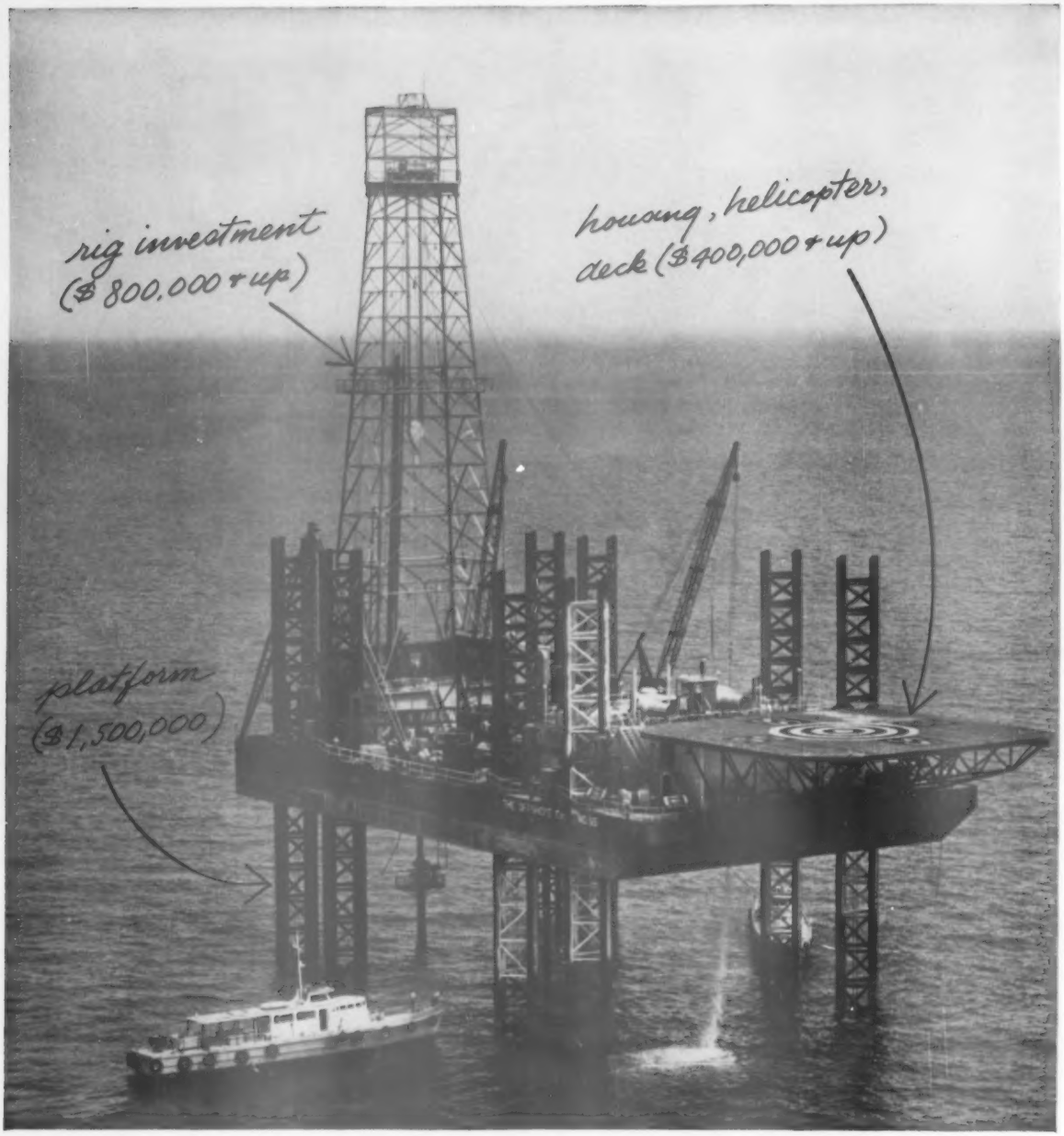
EXPORT OFFICE: 1011 INTERNATIONAL BLDG., NEW YORK 20, N. Y.

GULF COAST, MID CONTINENT, ROCKY MOUNTAIN AND CANADIAN DISTRIBUTOR FOR MARTIN-DECKER PRODUCTS.

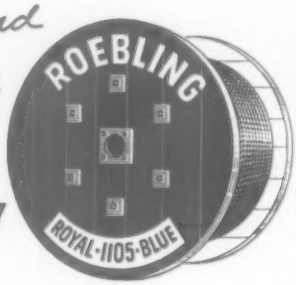
REED'S ROLLIN'



REED...only Reed offers HI-FLEX DRILL COLLARS AND CONNECTORS



When you spend $4,000,000 for an offshore rig you can't afford not to use the best rope



You wouldn't use Bargain Basement bits. You'd get the best. You'd get the best of everything; that's why an offshore rig can run as much as $4,000,000.

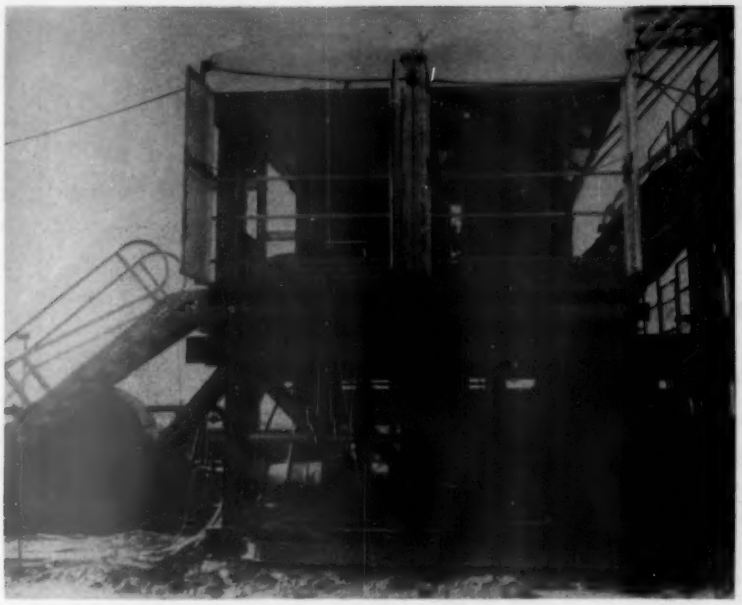
To settle for anything less than Royal Blue at this stage would, indeed, be "pound foolish." For Roebling Royal Blue Wire Rope represents in *its* field, the finest there is.

It is made from the toughest rope wire ever produced—Type 1105—extra high-strength improved plow steel. Royal Blue has all the hard-working advantages of preformed construction; outstanding resistance to abrasion, fatigue, impact, crushing and shock; exceptional flexibility and ruggedness. Collectively, these values add up to 15% more strength than in any other rope you have ever used.

Anything less than Royal Blue can cost you *more*. Your distributor has Royal Blue right now. Get it now and save and save and save. For information on Royal Blue, write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation



FLUID-COUPLING OIL COOLERS are installed in front of the condenser-radiators on Great Western's Rig 4. Even this added load has not caused any overheating in the ebullient-cooled engines.

Now rig engines are cooled by ebullition

Having proved themselves in many pipeline and marine services, ebullient-cooled engines are now making their debut in drilling-rig service. Here's one contractor who expects to get longer and more trouble-free service from his drilling engines in which jacket water boils.

BY ED McGHEE
Drilling Editor

SUMMERTIME heat has always been a source of problems for drilling-rig engines, causing them to run hot, robbing them of power, and spawning maintenance troubles.

Wintertime cold is as bad in many areas; it causes the engines to run below regular operating temperature, thus cutting down on efficiency, and forming sludge in the crankcase.

Great Western Drilling Co. believes that part of the answer to these climatic problems as well as to other common engine ailments lies in ebullition cooling. In essence, this method simply permits engine-jacket water to boil (ebullition means boiling). Steam generated in the jacket is condensed and returned to the engine.

True, jacket temperature is higher than is a conventionally cooled engine; but long use in other applications has shown that ebullition cooling does a more efficient job of taking heat away from the cylinders. As a result, cylinder-liner temperatures have been shown to be more uniform and generally lower than with conventional cooling.

Great Western has already fitted two of its rigs with ebullition cooling; it has ordered materials to so equip another. On the rig engines already equipped, the hottest of summertime temperatures have caused no noticeable change in the engine's operation. The company feels certain that the coldest of wintertime winds will not drop the operating temperature of the engines measurably.

With its engines running at a constant temperature regardless of the weather, Great Western always gets full power. Moreover, the company expects that engine maintenance will be cheaper in the long run.

Fan-cooled radiators . . . Great Western's Rig 9 is one of the two already equipped for ebullition cooling. It is powered by four Waukesha LRO gas engines. These engines are not new, having been reconditioned and fitted with the new cooling system after drilling service elsewhere with conventional cooling.

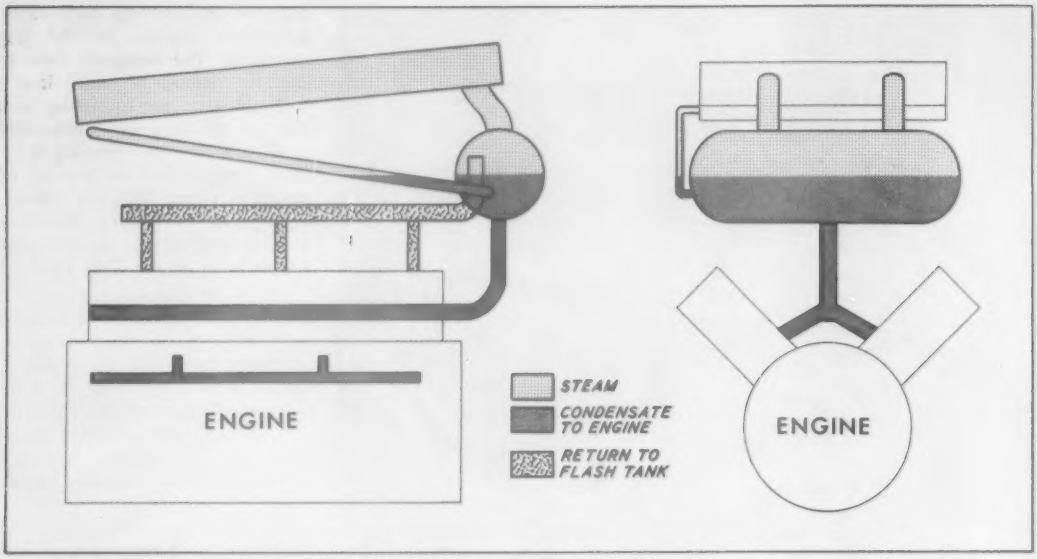
To make the conversion, a special cylinder-liner packing was installed and a cylindrical tank was mounted horizontally over each engine. To this tank, pipes were attached to bring all the water and steam up from the engine block. Once in the tank, some steam condenses, the remainder passes through a top outlet which carries it to the condenser. The condensate in the tank is then ready for recirculation in the engine.

The condenser is a conventional fan-cooled engine radiator, smaller than usual but mounted in the same manner as it would be for a conventional cooling system. Thus, except for the horizontal tank and its piping, there is little to show that these engines are different from others.

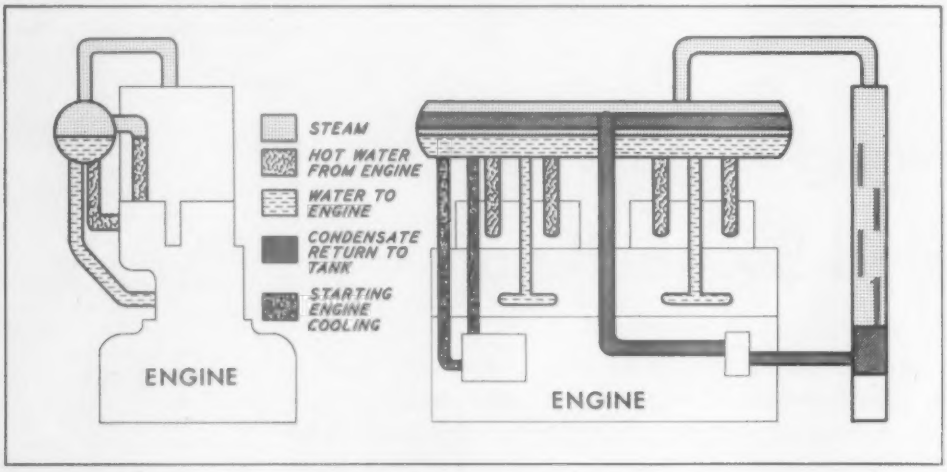
As the steam condenses and runs to the bottom of the "radiator," it is picked up by a small water pump and returned to the cylinder tank above the engine. Note this point. The water is pumped into the tank, not into the engine block. Circulation from the tank down into the block and back to the tank is purely thermal. This is, cooler water from the tank flows down into the block where it is heated and becomes lighter. Some of the water turns to steam. So, the heated water and steam then rise back into the tank. Two water pumps are necessary, one to pump hot water through the heat exchanger when LPG fuel is used.

A pressure cap keeps about 3 psi. on the system. At the altitude of the rig while at work near Maljamar, N. M., this pressure resulted in a water temperature of about 205° F. At lower elevations, temperature might run as high as 230°; however, the engines carry shutdown switches in case temperature should rise to 240° F.

The higher jacket temperatures in-



NEXT GREAT WESTERN RIG to use ebullient cooling will utilize Climax V-125 engines with horizontal condenser over engines. With this arrangement, no water pump need be used.



RIG 9 ENGINES are of the Waukesha LRO in-line type. There are four such engines on the rig, all outfitted for ebullient cooling.

crease crankcase temperatures only slightly.

Rig 4, too . . . The company's second ebullition-cooled unit is its Rig. 4. This medium-depth rig has two V-125 Climax gas engines. These engines were new when the cooling system was modified. General arrangement of the cooling system on the V-engines is similar to that on the in-line engines, the differences being those in piping made necessary by the V construction.

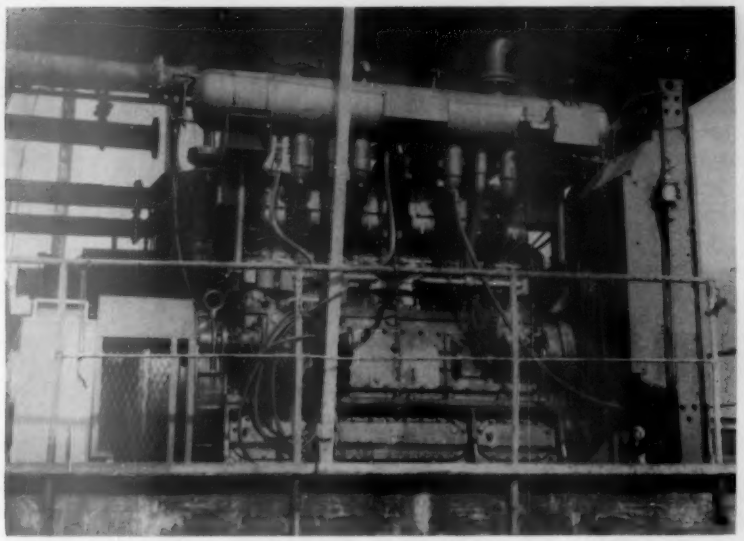
On both rigs, each engine could deliver slightly more horsepower if the condensers were specifically designed for ebullition cooling. Reason is that an ebullition engine requires a radiator fan consuming only about 5 hp. where a conventionally cooled engine would require a fan of about 20 hp. Moreover, there is a slight power saving in the water pumps on the ebullient engines.

And, on these engines, only about one-third of the radiator, which serves as the condenser, is needed for efficient cooling. In fact, Great Western has mounted radiators for its fluid-coupling oil in front of the radiators for the V-125 engines; even this added heat load has not caused the ebullition-cooled engines any trouble.

The third rig slated for the new cooling system will get three more of the Climax V-125 engines. However, these will differ from those on Rig 9 in that the condenser (specifically designed for ebullition) will be mounted horizontally on top of the engine, above the horizontal water tank. With this arrangement, no water pump will be necessary. Of course, steam will rise from the tank into the condenser; then, the condensed water will flow by gravity back into the tank. Cooling coils for the fluid-coupling oil will be a section of the steam condenser, eliminating a separate oil radiator.

Water pumps not only cost money to buy and operate, but they are also a potential source of leaks for the water. And, leaks can cause trouble as will be explained later.

Another advantage of mounting the condenser horizontally atop the engine is that wind direction will not affect the cooling capacity. On con-



TWO WATER PUMPS are needed on each Rig 9 engine. The second pumps condensate through the butane vaporizer when it is used.

ventional vertical radiators, if the wind blows from the wrong direction, it can cause air to recirculate through the radiator, thus bringing on overheating.

Condenser fans will be driven by hydraulic motors. Tubes in the condenser may be changed one at a time rather than as a complete unit.

No thermostats . . . A key to the success of ebullition cooling lies in the natural process by which the amount of water circulated into the block fluctuates exactly as needed. If the engine is loaded up, it generates more heat which forms more steam. More steam means more water condensed and more water condensed means more water circulated into the engine. If the load is taken off, less heat is generated and less steam forms. Less steam means less water condensed and less water returned to the engine. It's a self-regulating process which needs no outside controls.

Contrast this with a conventionally cooled engine where the water pump runs at a constant speed to force a constant amount of water into the engine. To keep the engine at a near-constant temperature, thermostats must open and close. Of course, in most instances, the conventional engine with thermostats performs well. It is for extreme conditions that ebullition cooling is most attractive.

However, advocates of ebullition cooling say that not all the value of this method is in satisfying seldom-found extreme conditions. They say that under all conditions ebullition cooling prevents hot spots from developing in the engine. Once the engine is at operating temperature, thermal stresses don't change. Result, they contend, is longer life for liners, pistons, valves, rings, and other engine parts.

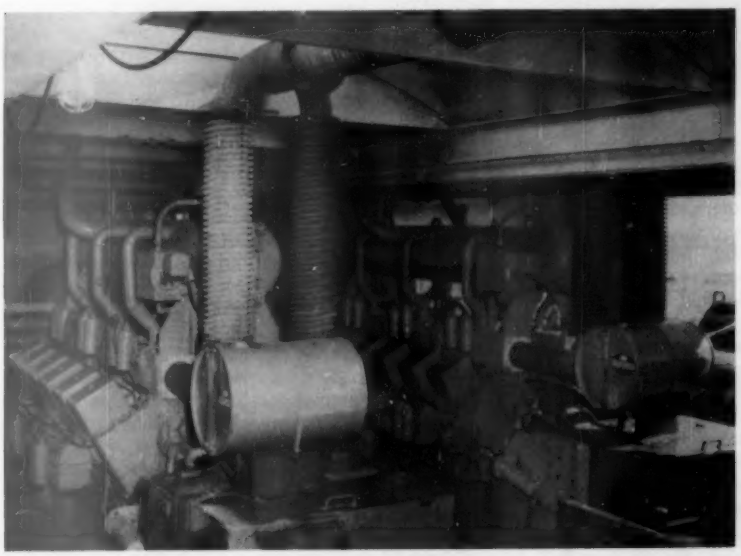
Water for ebullition . . . The engines Great Western has just recently converted are not its first with ebullition cooling. A single engine was so equipped several years ago. This engine was set on a rig with other conventionally cooled models. Experience with this engine convinced the company that ebullition cooling is economically attractive.

Operating this first engine was not without its problems. Rig crews, totally unfamiliar with the principles of ebullition cooling, added untreated water to the engine frequently. Of course, as water boils in the engine, it leaves behind in the block any materials it carries in solution. Over the years, scale from the hard water accumulated in the block. Eventually this scale prevented proper cooling.

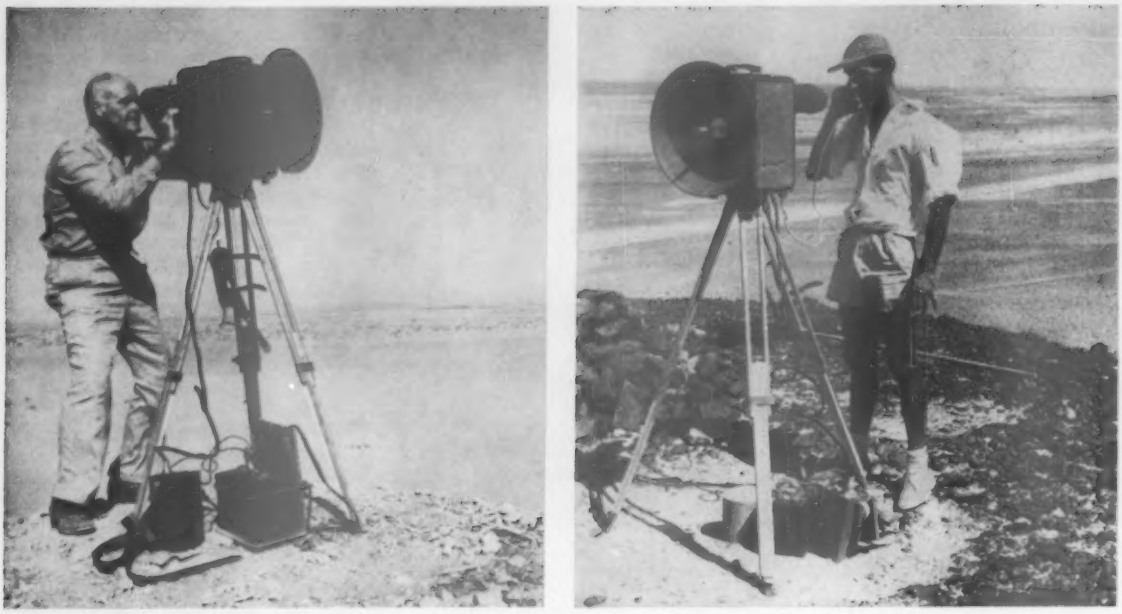
This experience, Great Western felt, was no reflection on the merits of ebullition cooling but, rather, on the way that the system was operated. For this reason, the company is making certain that its crews understand the principles of the cooling system and why no more untreated water than necessary should be added to it.

The cooling system on an ebullient engine is theoretically closed. That is, the only reason water need be added is to make up for that lost through leaks. Thus, as long as leaks are prevented, there should be less of a scaling problem than with ordinary cooling. Biggest source of leakage on the ebullient-cooled engines has been the water pump.

Not all engines can use this cooling system. Reason is that some water jackets contain high spots in which steam would become trapped, preventing the free thermal circulation necessary to ebullition cooling. Engine manufacturers themselves are divided on the question of whether ebullition cooling should be applied even to those models which allow it. Some makers favor the method; others advise against it; and many are simply noncommital.



HORIZONTAL TANKS above engines on Rig 4 are only outward sign of ebullient cooling. Engines have been equipped with special cylinder-liner packing. Radiators are conventional, but are actually oversize because ebullition system requires less cooling surface and less fan capacity.



TELLUROMETER, consisting of two units each with a radio transmitter and receiver, is shown at work on an African survey. A pipeline company tried it in California and found . . .

New tool measures distance *fast*

Here's how it saved in surveying a pipeline route

BY MAURICE E. FULLER
Pacific Lighting Gas Supply Co.

WITH THE AID of a recently developed survey instrument—a Tellurometer—a pipeline-route survey was completed for Pacific Lighting Gas Supply Co. with a saving in both time and money. The Tellurometer is designed to perform one function, that of measuring long distances with accuracy and speed.

Part of a project to bring additional out-of-state gas to southern California is the installation of approximately 117 miles of 34-in. pipeline starting at the Colorado River and extending westerly. The river crossing will be located approximately 6 miles north of Needles, Calif., with the entire route lying in desert wasteland. Except for about 10 miles located in rolling hills, the route lies in flat terrain with no unusual surveying problem.

An interesting feature of the job was the existence of old gunnery and tank-training ranges used during World War II. There was no guarantee that three sections of the route, totaling 6 miles, were free of dud projectiles or practice land mines. The time schedule did not permit clearing the strip prior to the survey so it was necessary to survey these sections without entering them. Fortunately, the route was free of horizontal angle points across these sections.

Paper presented at PCGA conference, Palm Springs, Calif., 1959.

Landowners were numerous for the barren country of the route. In addition to desert land entries and mining claims by individuals, there was a 1 mile square checkerboard pattern of alternating ownership by a railroad and the U. S. Department of Interior. The total number of owners was 35, with 94 parcels to be crossed and located by the survey.

Five U. S. Coast and Geodetic Survey monuments located within 2 miles of the pipeline route were used to establish basic control for the survey. A sixth monument, approximately 12 miles from the route, was utilized to establish the basis of bearings.

Although the pipeline route was through wasteland where a wide right-of-way could be secured at reasonable cost, the survey had to accomplish substantially the same things as one made in more highly developed areas. Bids for the route survey were taken, providing among other things, that each point located by the survey was to be accurate within 5 ft. of its true position and that the Lambert coordinates of each horizontal angle point and control point were to be determined.

The surveyor was given plats produced from data taken from preliminary title reports, showing owners located within ¼ mile of the route and was required to determine which owners were crossed.

Aerial Control, Inc., of Woodland Hills, Calif., was the successful bidder. This firm had worked for the company a year earlier to establish ground control in mountainous country in connection with a pipeline-route survey by photogrammetry. Because of the long sight distances on the desert route, the photogrammetric process was not best suited. Therefore, Aerial Control made its proposal based on using a Tellurometer which is capable of measuring distances up to 40 miles with one setup.

Distances are determined from the

time it takes an ultrahigh-frequency radio wave to travel from a transmitter to a reflector and back. By measuring the phase relationship of the transmitted and reflected radio wave, the time interval is measured in billionths of a second. Distances shorter than 500 ft. are difficult to measure, but high-order accuracy is possible on longer distances.

Accuracies which can be expected are as follows:

Length of line	Accuracy
500 to 1,500 ft.	1: 5,000
1,500 to 1 mile	1:10,000
1 to 40 miles	1:20,000

Two units . . . The Tellurometer consists of two major components, both equipped with a radio transmitter and receiver, sometimes referred to as the "master" and "remote" units. When in use, each unit is mounted on a tripod and is powered with a 6-volt storage battery. The total weight of each unit is about 85 lb. making for portability.

Each unit contains a variable-frequency crystal, capable of producing radio waves in range of 2,900 to 3,200 megacycles per second. In order to provide communication, a short-wave radio is built into each unit. The master unit is equipped with a 2½-in.-diameter oscilloscope, marked with 100 radial lines.

When the equipment is in operation, there appears in the oscilloscope a circular pattern having in it a break about ⅛ inch long, measured along the circumference. The leading edge of the break in a clockwise fashion will appear at a position on the scope which represents the time interval for the radio wave to travel from the transmitter to the receiver and back.

Each radial line on the oscilloscope represents a time interval of one billionth of a second which, translated into the velocity of a radio wave, represents a minimum distance of approximately 6 in. Readings of the oscilloscope can be interpolated so distance determinations are accurate within about 2 in. This accuracy is independent of the length of line under measurement.

By modulating the radio wave, readings on the scope are successively taken in units of 50, 500, 5,000, and 50,000 ft. When set to read in 50-ft. units, the pattern on the scope will rotate once through 360° as the Tellurometer units are moved 50 ft. along the line being measured. Similarly, when set on 500-ft. units, the Tellurometer must be moved 500 ft. for the scope pattern to rotate one revolution, etc.

Simply stated, the measurement with the Tellurometer is done by determining how many of each of these units lengths is contained in a given distance. From this characteristic of the equipment it may be seen that one must know to the nearest 50,000 ft. the length of the line being measured. It also accounts for the fact that accuracy is maintained over the complete range of the instrument.

Time required . . . Setup and operation time for measuring a line, regardless of its length, is about 30 minutes. With the master unit and remote unit at opposite ends of the line to be measured, the conditions which affect the velocity of the radio wave are noted before and after the time interval is measured. These factors are air temperature, atmospheric pressure, and relative humidity. Graphs containing the variables for these factors have been prepared from which the standard velocity is readily determined.

Included in the operation for each length measurement is a check of the results by measuring the time interval with additional radio waves of different frequency. For this survey, the control traverse distances were measured by taking readings on six frequencies. If a variation was noted on any frequency setting, additional read-

S. E. HUEY & CO.

ENGINEERS & SURVEYORS

OUACHITA BANK BLDG.

MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

MODEL D

Sonolog

ACOUSTIC WELL SOUNDER

U. S. Patent No. 2,348,911 — Trade Mark Registered

For determination of liquid level in producing oil wells, static or pumping bottomhole pressure, productivity index, pump performance, adjustments for gas lifts, etc.

Used in U.S.A., Canada, Argentina, Brazil, Colombia, Venezuela, Trinidad, Austria, Germany, Holland, Yugoslavia, Egypt, Morocco, Borneo, Indonesia, New Guinea, Saudi Arabia, France.

KEYSTONE DEVELOPMENT CORPORATION

2813 Westheimer Road — Houston, Texas

Which gas scrubber costs less?

Isn't it obvious that the smaller unit on the right costs far less to fabricate or to buy? Yes, you get more for your gas scrubbing dollar with Hi-eF Purifiers, scrubbers, separators and mist extractors. Analyzed in terms of efficiency they outstrip any unit, yet are ⅓ the size of most. For complete details, write for Bulletin 803.

SEE OUR AD IN REFINERY CATALOG

THE V. D. ANDERSON COMPANY

division of International Basic Economy Corporation

1977 West 96th Street • Cleveland 2, Ohio

ANDERSON Hi-eF PURIFIERS

PURIFIERS . . . SEPARATORS . . . SCRUBBERS

ings on a different frequency were taken until consistent results were obtained.

For the traverse of the pipeline route, readings were taken on four frequencies. In addition to the other readings, the vertical angle between the ends of each line and the horizontal plane was measured. This information was used to reduce to a horizontal distance the slope distance which is measured by the Tellurometer.

The elevation was obtained at each point for which Lambert coordinates were to be determined, so the coordinates could be based on a plane through mean sea level. For this survey, elevations could be obtained with sufficient accuracy from USGS quad sheets.

TABLE 1—BASIC CONTROL AND SECTION TRAVERSES

Traverse	No. of courses	Average length per course (ft.)	Traverse closure distance (ft.)	Average correction per course (ft.)	Ratio of error
Basic	10	60,313	11.65	1.16	51,770
1	25	3,480	7.02	0.28	12,460
2	7	6,540	1.94	0.28	23,610
3	24	6,450	13.29	0.56	11,400
4	23	6,330	7.20	0.31	20,190
5	10	2,428	2.20	0.22	11,030
6	9	5,150	4.43	0.49	10,430
7	24	5,900	13.31	0.55	11,000

Two phases . . . The field survey was done in two distinct phases. In the first phase, a basic control traverse was run for the entire route with ties to nearby USC&GS monuments. Following this, a traverse of the pipeline centerline was run in seven sections and adjusted for each section to the values determined on the basic traverse. At the same time the necessary ties were made for legal descriptions and locating parcels of different owners.

A Tellurometer and a 1-second theodolite were used for field work for both phases of the survey. The theodolite was used at each horizontal angle point but since the lengths were determined in only one direction it was possible to "leapfrog" with the Tellurometer master and remote units. Results of the basic control and the section traverses are shown in Table 1 to indicate the closure error. Without exception, the accuracy was well within the limits required.

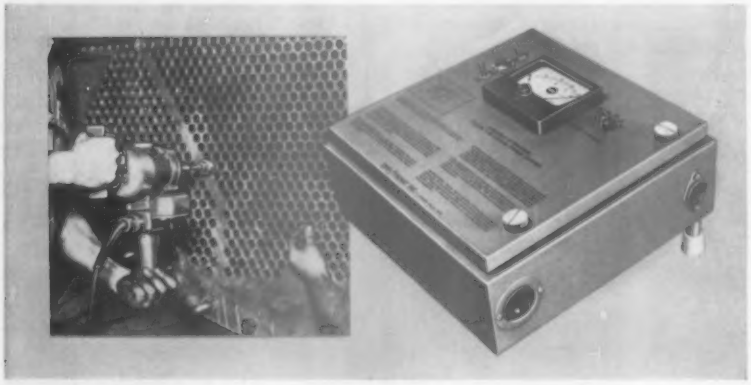
When it is necessary to take data on which calculations are based, it is of interest to know what error in the final result would be introduced by errors in field observations. The effect of assumed errors is shown in Table 2. In much work the error introduced by a constant average value for these variables is small enough to be ignored. In Table 2, the errors shown are based on a line 60,000 ft. long.

Fast survey . . . An outstanding feature of the survey was the speed with which it was made. In 3 days, Tellurometer work for the basic control survey was completed on the entire route. This speed was possible because of the long sight distances which

TABLE 2
EFFECT OF ASSUMED ERRORS

Observation	Assumed error in observation	Resultant error in measured length (ft.)
Air temperature . .	10° F.	0.18
Atmospheric pressure	0.1 in. Hg.	0.06
Relative humidity . .	10%	0.18

Your Motor + Wiedeke Torque Control = Increased Tube Rolling Production



Save the cost of a new motor! New Torque Control Instrument for rolling ¼" through 4½" tubes in boilers, condensers and similar heat transfer vessels —operates with any Universal Reversible Electric Tube Rolling Tapper or Motor. Adjustable time cycle matches operator's dexterity.

WRITE TODAY FOR DETAILS AND BULLETIN AC-7A

The Gustav WIEDEKE Company
Dayton 1, Ohio

"I DON'T KNOW WHAT IT IS, BUT IT CAME FROM CROSE... THEY HANDLE EVERYTHING!"

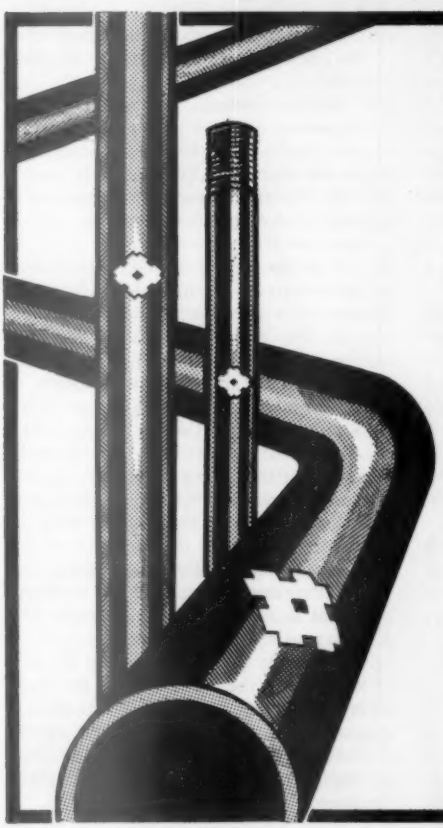
IF IT'S NEW AND BETTER, CROSE MADE IT!

In the pipeline construction industry around the world, Crose is recognized as the manufacturer of new, better equipment . . . equipment that is always rugged and dependable, gets the job done faster and more economically.

Crose

MANUFACTURING COMPANY, INC.

2765 Dawson Road • Phone WEbster 6-2171 • Tulsa, Oklahoma • BRANCH OFFICES: Houston • Denver • Elizabeth, N. J. IN CANADA: Crose-Curran Ltd., Edmonton, Alberta



INCREASE
Your
Productivity
with
Our
Oil Country Tubular Goods & Line Pipe

SUMITOMO METAL INDUSTRIES, LTD.

Head Office: 31, 4-chome, Kawaramachi, Higashi-ku, Osaka, Japan
Cable: "SUMITOMOMETAL OSAKA"
Tokyo Office: Shin Sumitomo Bldg., 8-6 Marunouchi 1-chome, Tokyo, Japan
Cable: "SUMITOMOMETAL TOKYO"

The Oil and Gas Journal's New Pipeline Wall Map

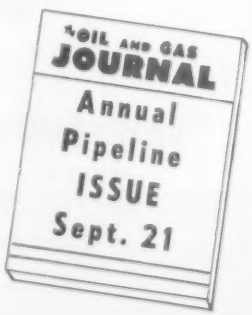
Your New Journal Map Is Ready!

COMING TO YOU next week will be a brand-new 3 by 4-ft. map showing products lines on one side and crude lines on the other, with refinery locations and names. It automatically goes to Journal subscribers with the Annual Pipeline Issue of September 21. For 37 years, the pipeline issue has consistently presented its readers with a wealth of useful pipeline information.

FOR THE FIRST TIME this year, the Annual Pipeline Issue will include a special 15-page maintenance section. More innovations have come into pipeline maintenance in the past 2 or 3 years than at any previous time. The special maintenance section will include new practices used by some of the nation's top pipeline companies.

PIPELINE CONSTRUCTION and operation will be featured in a number of exclusive articles. These will include current construction projects, the new airport products line at Love Field, and a new method for selecting pumping units.

KEEP UP with the trends in pipelining. Read next week's Journal.



permitted single setup measurements up to 30 miles long. Field work on the pipeline traverse (including measurement of both the angles and distances) required 3 weeks in the field. A three-man crew was used in taking length measurement on the basic control survey while a total of six men were used on the pipeline traverse.

It is difficult to demonstrate what savings in cost could be traced to use of the Tellurometer. No bids were taken for a conventional survey, but it is believed likely that the company realized a savings of about 15%. Had a conventional survey been made to the same degree of accuracy, it is expected that the savings would have been considerably more.

Characteristics . . . The Tellurometer has certain characteristics which should be remembered when considering its use.

1. It is capable of producing accurate results.
2. With precise length measurements, a traverse is a "strong" survey and the results of triangulation can be achieved by traverse with less field and computation time.
3. Measurement is speedy; no more time is needed for long lines than for short ones.
4. The Tellurometer is of limited usefulness on lines shorter than 500 ft.
5. There is no need to occupy the line being measured except at the ends.
6. Measurement is possible without seeing between the master and remote units. Fog, haze, and darkness do not affect the Tellurometer.
7. The units need not be precisely pointed at each other. An angle of 20° does not affect the result.
8. Steps should be taken to guard against error introduced by interference by other radio waves.
9. The distance measured is slope distance.

Based on this experience with a Tellurometer, Pacific Lighting Gas Supply Co. feels that it is a valuable addition to the growing list of tools now available to the modern surveyor. For surveys where long distances are to be measured, the Tellurometer is at its best. Where the survey is to be through mountainous country, the Tellurometer is believed to be most useful to establish ground control for a survey by photogrammetry.

It is felt that on a survey of any magnitude, the Tellurometer or similar instrument will achieve a better combination of accuracy and speed than possible if length measurements are left to the conventional surveyor's chain.

IN SECONDS the full history on a given pump or turbine in Standard Oil of California's Richmond refinery can be found. Vertical file in background gives item number and its location, both in the plant and in slide file in foreground. A full history of each piece of equipment is given on each master card in the slide-file record.

Standard of Cal improves its maintenance data-handling techniques

BY G. F. SAUER
Machinery Specialist,
Standard Oil Co. of California

NEW TECHNIQUES in handling maintenance data on equipment are boosting the efficiency of the 160,000-bbl. Standard Oil Co. of California refinery at Richmond, Calif.

A new system which includes Kardex slide and Linedex vertical files is replacing a file-folder method. One card in the slide file is assigned to each piece of equipment, and a cross-reference notation in the vertical file enables a clerk to find the proper card instantly.

There are over 15,000 pieces of machinery and other equipment to maintain in the plant. They range from small, simple motors to a great number of large turbines and pumps.

Maintenance and repair of this equipment is centered in the machine shop. To do the job properly, we must keep extensive files of work orders on repairs, as well as maintenance records and other pertinent data which give the complete history on a piece of equipment. But the amount of paper which collects over a period of time can build up to a point where the system becomes clumsy and time-consuming, and thus dissipates essential job control.

File-folder method . . . The file folders have been filed numerically by equipment number (a number attached to all mechanical equipment and assigned primarily for tax purposes). The data were accumulated by retaining a copy of each work order.

This meant that on each piece of equipment it was necessary to file work orders. Since this type of equipment generally needs considerable work over the long haul, we were building bulky files of paper. Finding a specific cause for repair became a problem.

Our new system, designed by Remington-Rand, will eventually eliminate almost all this cumbersome work. All repair, part replacement, and maintenance information can now be checked off on one card. There is no longer any need to wade through a bulky file of work orders to find the story on a given pump and connecting turbine or motor.

Each piece of equipment has its own record. Figuring normal maintenance frequencies, one card will last about 4 years before it has to be replaced.

In addition to the card proper, there is a separate title insert which is always visible in the bottom edge of the slide-file pocket. On it is noted a complete description of the equipment, the date it was installed, and its location. It also carries all the nameplate data—size, serial number, type, manufacturer, material description of certain component parts, and certain other design features.

Crossindexing . . . We are now indexing by process plant and are cross-indexing by equipment numbers. Practically every plant process has a pump which is designated as P-1. By adding the equipment number to each of these, we can pinpoint in which plant the particular pump is located.

The essential ingredient of this crossindex is the vertical file. Each time we type a card record, we make a crossindex card. This gives the name and number of the item, and its location. A quick glance at the vertical stand shows us exactly where the complete card on a certain pump or turbine is located.

We now have the records for all the equipment in each process plant in one spot, available at a glance through one or two slides. We can look at the card of a certain turbine, and tell immediately that it has been worked on six times in 5 months. Under the old system, just to learn that simple fact could take 4 hours.

Color aids . . . We use colored cards and colored visible signals to help us spot other factors quickly. Cards which cover turbines are pink, because often the plant number of a turbine is identical to that of the connecting pump. These are next to each other in file so that different color (pump cards are white) tells us which is which.

We use two signals in the visible margins: orange, to show the number of breakdowns or the time of the last repair; and a green Graph-A-Matic signal to show the month the next maintenance check is due. This is adjusted simply by sliding it to the proper point in the title insert.

Preventive maintenance is a big factor in our operation. It has proved itself invaluable in cutting down and eliminating unscheduled down time in the various plants. Our new system makes it possible for us to keep a much closer record of when that maintenance is due, and to make sure we don't miss it.

The system serves as a record for all our equipment. And it is important that people be able to find such information. The history of a piece of equipment is a key guide to future purchase.

We get calls from California Standard people all over the United States requesting data on a certain pump or turbine. When they are in the process of buying, they need this information to determine what is the best equipment for their purpose.

Here's a

Pressure-enthalpy diagram for JP-4 fuel

BY THORPE DRESSER AND R. B. SMITH
Sinclair Research Laboratories, Inc.

THE VAPOR-COMPRESSION cycle is an important consideration in the use of jet fuel. And accurate values of thermodynamic properties at temperatures and pressures of use are necessary, both for the evaluation and use of the fuel.

This P-H chart provides a convenient representation of these important properties, based on the characteristics of the typical JP-4 fuel outlined in Table 1.

The chart was constructed using generalized thermodynamic data. There is no essential difference in the theory of the construction of a chart of this type from the set of assumptions ordinarily used in making heat and energy balances. These involve the concept that a hydrocarbon mixture closely follows the ideal mixture behavior and will deviate from ideal gas, enthalpy, and entropy relations in the same way as a pure substance having the specific characteristics of gravity, boiling point, characterization factor, molecular weight, critical temperature, and critical pressure of the mixture.

On a P-H diagram, the vaporization characteristics of the specific mixture are necessarily included in the coordinates defining the bubble line and dew line.

Chart sources . . . The relationships involving pressure, enthalpy, and temperature are derived from Hougen and Watson,[1] Figs. 63, 66, 67, 68 and 106. Corrections to the enthalpy of the liquid near the critical point were made, although they were small.

The relationships involving pressure, temperature, and specific volume were established by the simple relationship $PV = zn\,RT$ using Lydersen, Greenkorn, Hougen.[2]

The relationships involving pressure, temperature, and entropy were calculated for the superheated vapor region, the zero value of entropy being chosen as the liquid at 0° F.

In the construction of the chart, the temperature parameters are placed on the pressure-enthalpy coordinates first because it is convenient to plot the other two parameters of entropy and specific volume in terms of pressure and temperature. We selected 0° F. as the point of zero enthalpy of the liquid. It is, of course, necessary to define the liquid and vapor regions completely, although the chart is to be used only in the vapor region.

This was done by deriving a TBP curve from the ASTM distillation by the method of Edmister,[4] and then dividing this TBP into cuts, after the method of Lewis and Wilde.[5] The bubble and dew lines were then computed using conventional vapor-liquid equilibrium constants, Figs. 153, 154,[1] for pressures up to the critical point. Enthalpies are then computed along these lines to define the phase boundaries in P-H coordinates.

Enthalpies . . . For the liquid enthalpies, the relation used in developing Fig. 66[1] was used, substituting 52.9° API and 12.00 K, to obtain:

$$C_p = 0.427 + 0.5705 \times 10^{-3}\,t \qquad (1)$$

and

$$H = 0.427t + 0.2853 \times 10^{-3}\,t^2 \qquad (2)$$

where t is in °F., on the bubble line. For example, at the average point of 319° F., H = 166. The correction for liquid enthalpies for deviation from ideality up to the critical point turns out to be negligible for JP-4 fuel.

The first step in computing the vapor enthalpies is to add the latent heat of vaporization to that of the liquid at some point, usually the atmospheric boiling point, which can be taken as the average boiling point, 319° F. This is taken from Fig. 68[1] at 130 mol. wt. to be 125 B.t.u./lb. then adding the liquid enthalpy gives 291 B.t.u. per lb. vapor enthalpy at 15 psia. and the dew line. The dew-line enthalpies are then extended over the pressure range of the chart using the equation of Fallon and Watson,[1] (p. 336). When substituting K = 12.00 in this equation it becomes:

$$C_p = 0.307 + 0.6524 \times 10^{-3}\,t - 0.153 \times 10^{-6}\,t^2 \qquad (3)$$

and ΔH above 0° F. is:

$$\Delta H = 0.307t + 0.3262 \times 10^{-3}\,t^2 - 0.051 \times 10^{-6}\,t^3 \qquad (4)$$

Equation 4 gives ΔH above 0° F. whereas the value of vapor enthalpy has been determined only at 319 ° F.

In computing vapor enthalpies for the chart it will be more convenient to work from the 0° F. base, which is readily determined by subtracting the value of Equation 4 at 319° F. (129.4) from the atmospheric point (291) to give the enthalpy of the vapor at 0° F., 161.6 B.t.u. per lb.

It is necessary to correct vapor enthalpies for deviations from ideality using Fig. 106.[1] For example at 600° F. and 300 psia., H* = 452.2 B.t.u. per lb. and the correction for nonideality from Fig. 106[1] is —30 B.t.u. per lb. so that H = 422.2 B.t.u. per lb. (Note that an H* — H correction of 2.7 B.t.u. per lb. is required at 319° F. and that 1 g.-cal. per g.-mole-°K. = 1 B.t.u. per lb.-mole-°R.). Corrected enthalpies for even values of temperature and pressure are computed over the desired chart range, and the temperature grid laid out.

Entropy grid . . . The general scheme for placing the entropy grid is to compute entropies for the vapor along one pressure ordinate, e.g., 15 psia., and after selecting even values for the S parameters, they are extended at constant entropy to form the grid. The basic equation relating temperature, enthalpy, entropy, volume, and pressure is:

$$dH = TdS + Vdp \qquad (5)$$

(Compare Hougen and Watson,[1] p. 455)

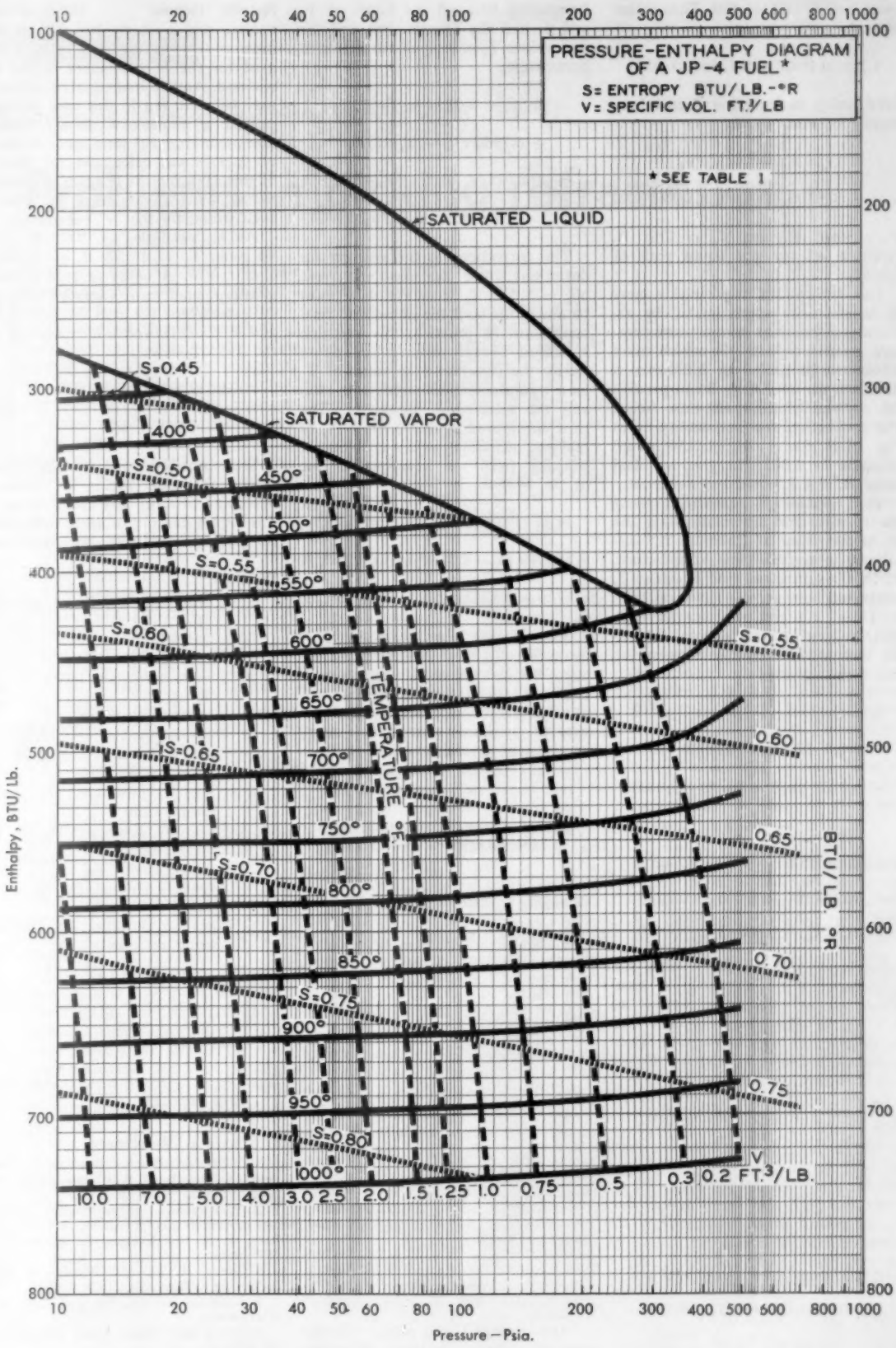
While the absolute value of entropy really makes no difference in the use of this chart in the vapor region, it is customary to assign a zero value of entropy at some base, such as the liquid at 0° F. chosen for this chart. At constant pressure, Equation 5 reduces to:

$$dH = TdS \qquad (6)$$

and since C_p is dH/dT at constant pressure:

$$dS = C_p\,dT/T \qquad (7)$$

For the liquid path at 1 atm. from 0° F. to the bubble point, the C_p of the liquid, Equation 1, may be used if absolute temperatures are substi-


PRESSURE-ENTHALPY DIAGRAM OF A JP-4 FUEL*
S= ENTROPY BTU/LB.-°R
V= SPECIFIC VOL. FT.³/LB
*SEE TABLE 1
SATURATED LIQUID
SATURATED VAPOR
S=0.45
S=0.50
S=0.55
S=0.60
S=0.65
S=0.70
S=0.75
S=0.80
400°
450°
500°
550°
600°
650°
700°
750°
800°
850°
900°
950°
1000°
TEMPERATURE °F.
0.55
0.60
0.65
0.70
0.75
V
10.0 7.0 5.0 4.0 3.0 2.5 2.0 1.5 1.25 1.0 0.75 0.5 0.3 0.2 FT.³/LB.
BTU/LB. °R
Enthalpy, BTU/lb.
Pressure – Psia.
10 20 30 40 50 60 80 100 200 300 400 500 600 800 1000
100 200 300 400 500 600 700 800

tuted, i.e., $T = t + 460$. Thus transformed,

$$C_p = 0.1645 + 0.5705T/1{,}000$$

Substituting in Equation 7 and integrating between limits:

$$S = 0.1645 \ln T_2/T_1 + 0.5705 (T_2 - T_1)/1{,}000 \quad (7a)$$

$T_1 = 460°$ R., and $T_2 = 779°$ R. giving a ΔS for the liquid path of 0.2686.

The entropy of vaporization may be satisfactorily approximated by assuming a constant temperature-pressure process at 319° F. which gives 0.1605 to be added to 0.281 for a final entropy of 0.4291 B.t.u. per lb.-°R. at the atmospheric dew point. The correction for nonideality from Fig. 107[1] for 1 lb. (1/130 mole) amounts to 0.0025 to give an ideal value of 0.432.

The remaining calculations along the 15-psia. line are made using the C_p of the vapor of Equation 3 transformed to use absolute temperature, T. This is substituted into Equation 7, integrated between the limits of 779° R. (319° F.) and any desired temperature and added algebraically to the base value of the entropy at the dew point, giving:

$$S_a = 0.4291 - 0.0262 \ln T_2/779 + 0.7932 (T_2 - 779)/1{,}000 - 0.0765 (T_2^2 \times 10^{-6} - 0.607) - \Delta S_{p2} \quad (7b)$$

Thus at 600° F.:

$$S_a = 0.4291 - 0.008 + 0.2225 - 0.0395 - 0.00065 = 0.6158$$

After laying out the even values for S parameters on the 15-psia. line, which can be assisted by the use of a T vs. H plot, the isentropes can be extended to both higher and lower pressures through the use of Equation 5 setting $dS = 0$.

$$dH = V\,dp = RT\,dp/p = C_p\,dT \quad (8)$$

which applies to the ideal gas.

Rearranging and substituting the C_p constants from Equation 3, in terms of 1 lb. of gas:

$$(R/130)(dp/p) = -0.0254\,dT/T + 0.7932\,dT/1{,}000 - 0.154 \times 10^{-6}\,T\,dT \quad (9)$$

Integrating between the limits of T_a and p_1 and the 15-psia. line and the new values T_2 and p_2 of the extended parameters:

$$0 = -0.0254 \ln T_2/T_a + 0.7932 (T_2 - T_a)/1{,}000 - 0.0765 \times 10^{-6} (T_2^2 - T_a^2) - 0.01528 \ln p_2/p_1$$

The corrections to the entropy for deviations from the ideal gas law, $\Delta S_p = S_p^* - S_p$ from Fig. 107[1] must be added for both the initial and final conditions. In practice, this equation is solved almost directly for p_2 to satisfy the equation at a value of T_2 on a t parameter (450, 500, 550, etc.) and the selected S parameter. The final substituted equation for 1 lb. of real gas, including gas-law corrections, working from the atmospheric line ($p_1 = 14.696$), is:

$$\ln p_2 = 2.6876 - 1.66 \ln T_2/T_a + 0.0519 (T_2 - T_a) - 5.005 (T_2^2 - T_a^2) + 0.5033 (\Delta S_{p2} - \Delta S_{pa}) \quad (10)$$

This solution is not truly direct because the ΔS_{p2} term must be evaluated at p_2. Because this term is numerically small, a rough approximation will usually bring a sufficiently good answer to guarantee convergence on p_2 on the first or second trial.

TABLE 1—SPECIFICATIONS AND PROPERTIES OF JP-4 FUEL

	Basis	Specifications
Gravity	52.9	§45, ‡57
Init.	138	...
10% distilled	218	...
20% distilled	256	‡290
30% distilled	307	...
40% distilled	315	...
50% distilled	331	‡370
60% distilled	342	...
70% distilled	355	...
80% distilled	367	...
90% distilled	381	‡470
End point	425	...
Residue	1.0	‡1.5
Loss	1.0	‡1.5
R.v.p.	2.65	§2.0, ‡3.0
Aniline point, °C.	57.6	
Volume ABP*	319	
Slope	2.0	
Cubic ABP*	314.6	
Watson K†	12.00	
Molecular weight	130	
Mean ABP*	307	
Molal ABP*	300	
Pseudocritical pressure, psia.	370	
Pseudocritical temp., °R.	1,087	

*ABP—average boiling point.[3] †Characterization factor.[1] ‡Maximum. §Minimum.

Specific volume . . . The specific-volume grid is simply laid out on the pressure-temperature grid without regard for the S parameters or the H abcissae. Any desired equation of state may be used, but in this case the improved "z" values of Lydersen, Greenkorn, and Hougen[2] were used. A value of 0.2538 was calculated for the z_c of this JP-4 fuel. It is again necessary to do some crossplotting to obtain even values for the "v" parameters.

As an example, at 700° F. and 46 psia., $T_r = 1.067$, $P_r = 0.1243$, $R = 10.73$. A value of $z = 0.9649$ is interpolated from Table V[2] at $z_c = 0.25$ between $T_r = 1.06$ and 1.07 and $P_r = 0.10$ and 0.20 (page 64 of the 1955 booklet[2]).

$$v = \frac{0.9649 \times 10.73 \times 1{,}160}{130 \times 46} = 2.008$$

The temperature and pressure ranges extend into the region of thermal decomposition, so that calculations in this region can be assumed valid only for processes of very short duration.

Glossary:

- C_p = heat capacity, B.t.u. per lb.-°F.
- d = differential operator
- H = enthalpy, B.t.u. per lb.
- K = characterization factor = $T_B^{1/3}/S$
- ln = natural logarithm
- R. = gas constant = 10.731 ft.³-psi./R.-lb.-mole = 1.987 B.t.u./°F.-lb. mole
- °R. = Rankine (absolute Fahrenheit) temperature
- S = entropy, B.t.u. per lb. = °R.
- t = temperature, °F.
- T = temperature, °R.
- v = specific volume, ft.³/lb.
- V = molal volume
- z = gas-law deviation = PV/RT
- Δ = finite difference

Subscripts:

- a = atmospheric pressure
- b = boiling point
- c = critical

Superscript (*) refers to ideal state (zero pressure).

References

1. "Chemical Process Principles" Combined Volume, by O. A. Hougen and K. M. Watson, John Wiley & Sons.
2. "Generalized Thermodynamic Properties of Pure Fluids," Lydersen, A. L., Greenkorn, R. A., and Hougen, O. A., Univ. of Wisconsin.
3. Smith, R. L., and Watson, K. M., Ind. Eng. Chem. 29, 1408 (1937).
4. Edmister, W. C., Pet. Ref. 289, 143 (Oct. 1949).
5. Lewis and Wilde, Trans. AIChE 21, 99 (1928).

The FOREMAN'S PAGE

Changing refinery conditions have brought new . . .

Problems in picking refractories

BY J. D. DENTON
A. P. Green Fire Brick Co.

REFRACTORY SELECTION, once a simple matter, has now become a complex task of analysis.

We add all the known facts of operation and classify them into neutral and destructive categories. The destructive items are considered and weighed and two or more approaches become apparent.

We now consider the installation from the standpoint of economy. Cost of materials, of course, is a major item but equally important is how long will it take to install and how long will it last?

Properties influencing selection and application:

1. Pyrometric cone equivalent (PCE). This, generally, is the temperature at which the specimen softens. The maximum service temperature to which the refractory will be subjected also influences this. Another important influence is the mean or average temperature which will be experienced.

Let's suppose we have a furnace with an exterior wall and an interior bridge wall with the interior of the furnace operating at 2,400° F. and the outside at 200° F. The mean of the bridge wall will be 2,400° F. since heat is on each side and equilibrium will be reached. The mean for the exterior wall will be 1,200° F. and service will be far less destructive.

2. Thermal conductivity heat flow. This is how much heat will be lost through the wall and the "k" factor is the unit of flow. The "k" factor equals the number of B.t.u.'s per square foot per hour per degree Fahrenheit per inch thickness at a mean temperature which has been preselected.

This property is generally more important when studying castables, plastics, and insulating materials since their efficiency from a thermal-conductivity standpoint is generally greater.

As a general rule of thumb, we think of most all firebrick in the same conductivity range. This, of course, varies with special refractories such as silicon carbides, etc. However, these are not generally used within the refinery.

It usually requires 2 in. of firebrick to equal 1 in. of plastic or castable refractory. For insulating firebrick and intermediate castable insulation refractories, this ratio jumps to 4 or 5 to one. For the lightweight insulations, both block type and castable block type, this ratio will run approximately 8 or 10 to 1.

Modulus of rupture and cold crushing strengths . . . These two tests are quite different in procedure yet the results of each are used to determine the structural strength of the products used.

In general, good refractory practice is to design the enclosure so that the structural portion of the dead load only will be imposed on the refractory. This is so that the refractory supports its own weight. In some instances, this is not possible so the physical strength must also be considered.

Support piers for grids and plates is an example of this condition. Another example will be a wall of exceptional height. The bottom of the wall could be subjected to high stress, depending on the added live load.

Another very important property of refractories is the ability to resist deformation when subjected to heavy loads at elevated temperatures. When this condition exists care must be taken to choose a refractory that will not subside or slump.

When refractories are subjected to rapid changes in temperature, the ability to withstand the stresses and not spall is most important. One very fine example of this could be the air heater where varying demands for heat exist. When highly cyclic operation exists, not only must high spalling resistance be present, but care must be given to the refractoriness of the lining. Heat releases in the combustion chamber can run so great that at times the best of refractories will soften and lower-grade refractories will melt or slag.

Abrasion resistance . . . While abrasion resistance is becoming more and more important within the refinery world to date, there its no standard test to date to use as a yardstick. One of the reasons is that three distinct types of abrasion occur.

One is a high-energy impact such as is encountered in the rotary calcining kiln. Another resembles that experienced with the grinding wheel and yet another is the sort that occurs with sand blasting. I'm sure you will recognize one or more such examples within the refinery. Most refractory manufacturers have testing facilities for all three of these conditions.

Atmosphere . . . Years back, nearly all furnaces had neutral or oxidizing atmospheres; however, with the development of the metallurgical processes, one or more problems popped up to influence selection of refractories. New metals allowed new processes to be developed which subject the linings to destructive atmospheres. Examples of these are the reducing atmospheres such as carbon monoxide, hydrogen, and chlorine.

In addition, certain gases such as hydrogen and helium, some inert, and others quite destructive are many times as conductive as air. These greater conductivities also must be considered when they exist.

Chemical analysis of the refractories selected at times determines that no compounds are present that can be reduced by these reactive gases.

Original presentation at WPRA meeting, Casper, Wyo.

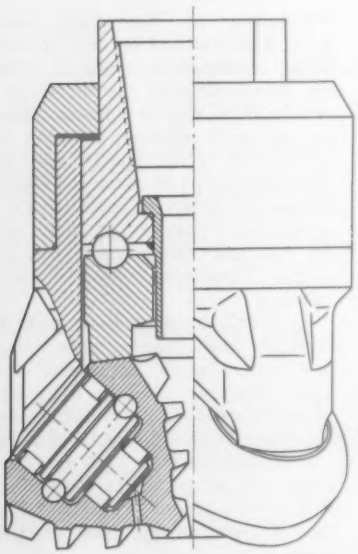
The Russians have produced some of the most revolutionary ideas for improving drilling techniques seen in recent years. Here is a good look at a few of their most startling ideas, including bits with unloaded bearings, drilling three wells simultaneously with a single rig, an electric downhole motor, and drilling with bottom-hole explosions. The following report is in the Russians' own words. The editors.

What the Russians have new in drilling

THE PROBLEM of longer life for rock-bit bearings has been solved. This has been done essentially by radical new bit designs.

The weight on bit is taken up immediately by the cones, bypassing the bearings. When bits with unloaded bearings (Fig. 1) are used, the weight is transmitted by a guide collar through the guide-collar bearing to the back cone of the cutter. The r.p.m. of the bit is equal to that of the turbodrill because the upper part of the guide collar is connected to the turbodrill and splined to the body of the bit.

This paper was prepared for the Fifth World Petroleum Congress, New York. The authors did not appear there to give the paper; those listed as authors include R. A. Ioannesyan, M. T. Gusman, A. A. Minin, G. E. Bulakh, and E. I. Tagiev all of the All-Union Scientific Research Institute of Drilling Technique, Moscow; also N. I. Titkov and F. A. Trebin, of the USSR Academy of Sciences, Moscow; and A. P. Ostrovsky, unidentified.

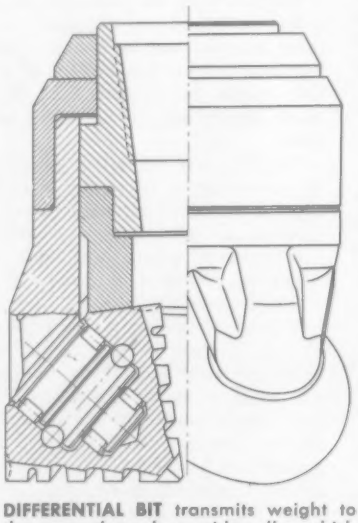


BIT with unloaded bearings transmits weight through guide-collar bearing to the back cone of the cutter. Fig. 1.

Another type of bit using the same principle is the differential bit (Fig. 2). With it, weight on bit is transmitted to the cones through a guide collar which rotates freely in the body of the bit. The system combining guide collar, cones, and the bottom of the hole works as a differential reduction gear. Therefore, the speed of rotation is slower and the torque on the bit is higher than that of the turbodrill shaft.

Research on strains in the differential pins under loading during drilling shows a reduction in differential bit strain, guaranteeing a longer life.

Low-torque bit . . . Another new type of bit, the low-torque bit, has rolling cones and is designed for use in plastic formations. The teeth are of essentially new design. The cutters are single-conic and self-cleaning. Self-cleaning is achieved by using four cutters, two of which gage the hole. The arrangement of the cones and the gaging allow minimization of torque for rotating the bit at a given weight.



DIFFERENTIAL BIT transmits weight to the cones through a guide collar which rotates freely in the body of the bit. Fig. 2.

While drilling with such bits in any formation, the specific torque values are lower than with conventional three-cone bits having milticonic cutters. This bit is designed for drilling deep wells at high weights; it increases meterage per day in deep wells, especially with small bits.

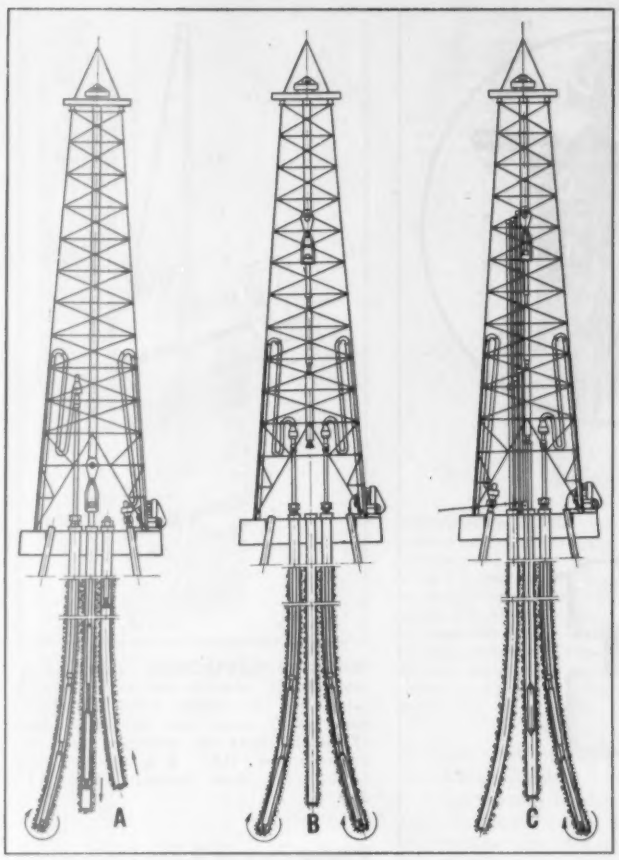
Three at a time . . . Improvement of directional-drilling equipment has been concentrated on the development of high-efficiency turbodrills, new deflecting tools, and instruments to control the hole azimuth from the surface. Special short turbodrills 1.5-4 m. long with a high power output in each turbine stage have been developed.

Sectional turbodrills with crossing section axes have been developed. Such a turbodrill is at the same time an effective deflecting tool which enables deviation to be increased and the azimuth to be stabilized.

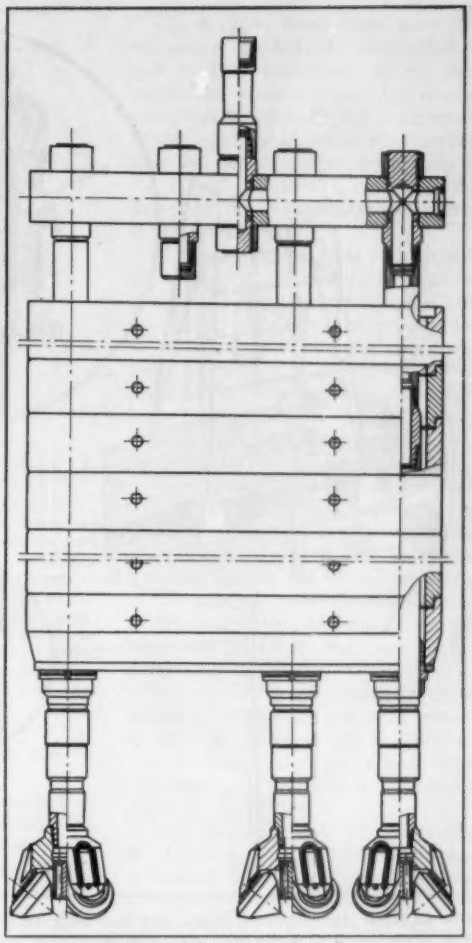
The instrument to control the hole azimuth from the surface is a hydraulic device which shuts down the turbodrill if the hole deviates from the predetermined direction.

The improvement of equipment for directional drilling has permitted the expansion of the use of simultaneous two-hole drilling and also permits drilling three holes simultaneously with one rig (Fig. 3). In the latter case rig-time saving amounts to 50%. More than 20 wells ranging in depth from 1,500 to 2,000 m. have been already bored by the three-hole drilling method.

Turbo-reactive method . . . The turbodrilling technique is now also used in other branches of industry, for example in running mine shafts. The turbo-reactive drilling system consists of parallel bits rotated by turbodrills. The whole system rotates due to the reactive movement of the turbodrills only (Fig. 4). Cuttings are removed from the bottom of the hole by upward flow of mud.



SIMULTANEOUS DRILLING of three holes allows for (A) automatic drilling in first hole and simultaneous round trip in second and third holes; (B) automatic drilling in first and third holes and changing bit in second; and (C) automatic drilling in third hole, and logging in second while first has been drilled to projected depth. Fig. 3.



REACTIVE-TURBINE DRILL can be used for drilling holes 3 m. in diameter. Whole system rotates due to the reactive movement of turbodrills only. Fig. 4.

Turbodrilling

Turbodrilling in oil and gas fields of the USSR increased from 65% of all drilling work in 1955 to 86.5% in 1959. The use of turbodrills has increased the drilling rates. In the period of 1955 to 1958 the average commercial rate of drilling increased from 896.4 m. per drilling rig per month to 1,210 m. per drilling rig per month. And the average penetration rate all over the USSR increased in the same period from 9.21 to 13.1 m. per hour.

In the eastern oil areas where wells of 2,000 m. in depth are drilled in hard formations within 10-15 days, the average penetration rate is equal to 20-30 m. per hour and the average meterage per bit is 30-40 m.

In the southern areas where wells of the same depth are drilled in plastic formations within 9-12 days, the average penetration rate is equal to 40 m. per hour and the average meterage per bit exceeds 200 m.

The considerable increase in the turbodrilling rate has been achieved by an increase in the bottom-hole power and by a decrease in the hole diameter from 12¾ to 7½-in.

New turbodrill designs . . . A number of turbodrills have been developed for drilling deep 9½, 8½, and 7½-in.-diameter wells. These turbodrills insure an increase in turbine drilling efficiency. Also turbodrills with small-diameter bits (5⅜ and 4⅜-in.) have been developed.

The reliability of sectional turbodrills has been improved by the use of conical threads with adjusting springs. The springs adjust the torque applied to the stator system in section connections. This has made it possible to increase the number of stages up to 350 and more.

The principle of action of the unit permits concentration and utilization of a practically unlimited power for rock crushing. This can not be achieved by any other known method of mine drilling. The turbo-reactive method permits high penetration rates in formations of any hardness.

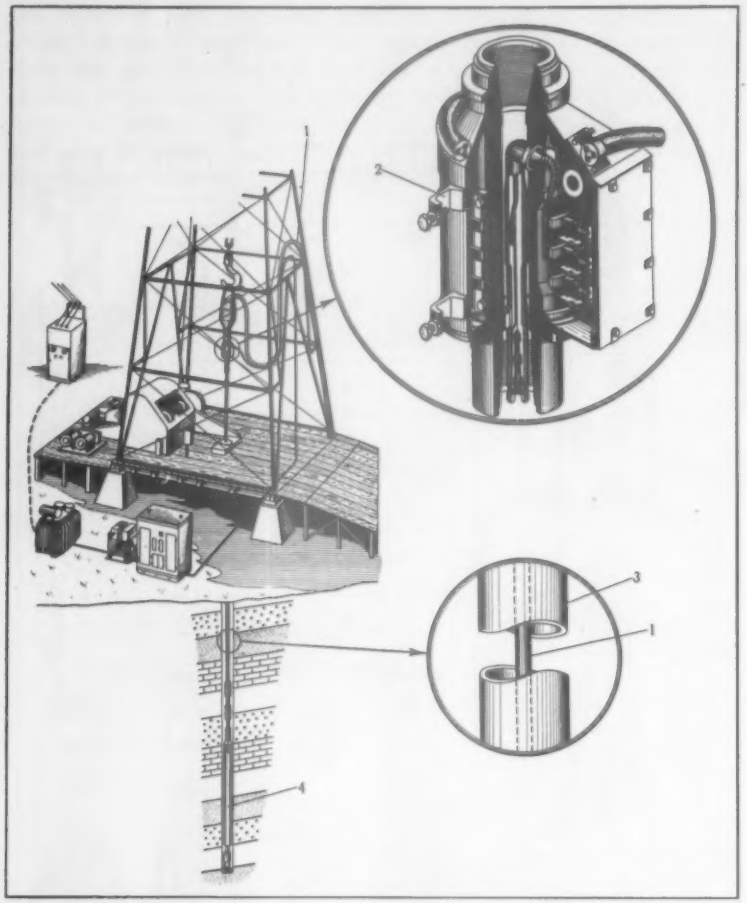
Turbodrills are widely used to bore wells for freezing under severe geological conditions, and permit straight holes at high drilling rates.

New Methods of Drilling

Deep and directional wells are successfully drilled in the Soviet Union by means of electrodrills. The rig layout for deep electrodrilling is shown in Fig. 5. Electric power is supplied to the electrodrill with the aid of cable through collector 2. Separate sections of the cable are mounted in the drill pipes. Each cable section has a male contact at one end and a female contact at the other which engage when the drill pipes are made up.

The electrodrill consists of two main parts—an oil-filled electric motor and an oil-filled spindle. The bit is connected to the shaft of the spindle.

The housings of the electric motor



RIG LAYOUT for electrodrilling. The numbers refer to cable (1), collector (2), drill pipe (3), and electrodrill (4). Fig. 5.

and spindle are connected by cone threads, their shafts connected through a toothed coupling. The electrodrill motor is a synchronous, three-phase, alternating-current with a shorted rotor.

The manufactured electrodrills come in 170 to 250-mm. diameters, turn 500 to 400 r.p.m., and consume 100 to 280 kw.

The power cable permits drilling with continuous control of the deviation angle, hole azimuth, and the deflection-device azimuth without time and labor-consuming round trips, all factors of great importance in directional drilling.

The above-mentioned angles are observed by three pointer instruments during the process of drilling. This is possible due to a special inclinometer mounted in the drill pipe above the electrodrill. The inclinometer operates on the time-impulse principle which insures measuring the azimuth and the deviation angles to within ±0.5°.

The process of electrodrilling is automatic and accurately controlled. Optimum performance of electromotor is effected without hand control.

And, it allows use of new technique, thereby extending the sphere of effective use of bottom-hole drives.

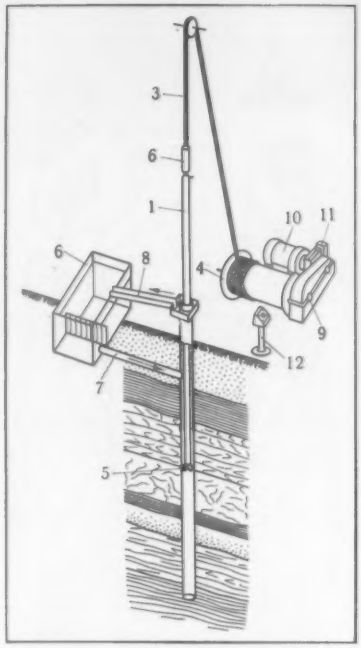
Moreover, the electrodrill permits using weighted drilling muds, aerated fluids, air or natural gas, and reverse circulation.

The trend toward slim-hole drilling necessitates the development of small-diameter (127 and 170-mm.) bottom-hole electric drives with high energy. The problem of power supply through small size drill pipes (3½ and 4½-in.) must also be solved.

The following new electromotors for electrodrills with a higher specific power and torque have been designed:

1. A three-phase motor with a rotating outer housing.

2. A low-voltage three-phase alternating-current motor of conventional type. This has one conductor in the slot or a rotating outer housing and a phase and voltage transformer connected above the electrodrill. The latter type is fed through a single-wire power-supply cable.



WIRE-LINE ELECTRODRILL utilizes electrodrill (1), electric swivel (2), cable wire line (3), winch drum (4), three-cone bit (5), mud tank (6), supply pipe (7), drain chute (8), reduction gear (9), electromotor (10), electromagnetic brake (11), and control panel (12). Fig. 6.

Pipeless electrodrill . . . The main advantages of drilling with a pipeless electrodrill are light weight and portability of the drilling unit and a sharp decrease in the time spent on round-trips and other auxiliary operations. This electrodrill permits use regardless of the fluid level in the well.

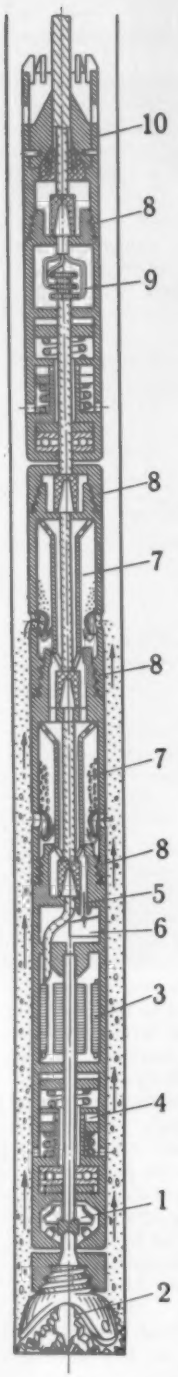
The arrangement of the drilling system is shown in Fig. 6. Local drilling-fluid circulation is effected by means of a centrifugal pump mounted on the shaft of the submersible electromotor. Cuttings are gathered inside the bottom-hole unit and periodically lifted to the surface.

The reactor torque on the bit of the early models of the electrodrills was relieved due to the inertia of the drilling unit housing which rotated alternately in both directions when reversing the submersible electromotor.

Several wells were drilled with such a unit.

In drilling with pipeless electrodrills, rotation constituted 40-50% of the time,, round trips amounting to about 6% of the time. This permits a drilling rate per month of 500-600 m. per rig.

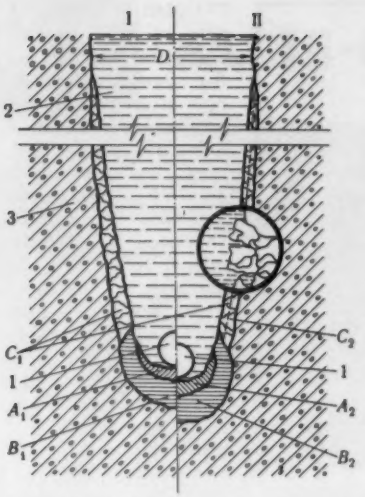
Three-cone bit tests at low weights-on-bit and speed up to 5,000 r.p.m. resulted in the development of a high-r.p.m. pipeless electrodrill. This elec-



RIG LAYOUT for drilling with electrodrill designed for 2,000-r.p.m. bit. Numbers refer to mud pump (1), three-cone bit (2), electromotor (3), protecting oil compensator (4), nozzle (5), nozzle relay for circulation control (6), cutting-trap bailers (7), connecting threads (8), electric swivel (9), and cable wireline connection (10). Fig. 7.

trodrill (Fig. 7) can drill at high rates.

The reaction torque of the bit used with this electrodrill is relieved due to friction forces arising between the electrodrill housing, the walls of the hole, and the fluid while the housing rotates in the opposite direction at 300-600 r.p.m. The cuttings are trapped by means of the centrifugal method which has replaced the nozzle



EXPLOSION ZONES resulting from the action of successive explosions on rock (schematic). First explosion is designated I; second explosion, II. Zones of crushing after first and second explosions are A_1 and A_2, respectively. Zones of predestruction are B_1 and B_2. Zones of hydraulic action are C_1 and C_2. Obtained hole diameter is D. Numbers refer to charge (1), fluid (2), and rock formation (3). Fig. 8.

method used formerly with the reversible electrodrill.

Experimental models of such electrodrills with 5¾-in. three-cone bits and 50-kw. electromotors were tested at depths up to 2,000 m. at bit weights in the range of 0.6-0.8 ton. The penetration rate with these electrodrills increased 2-2½ times as compared with that with reversible electrodrills.

The pipeless electrodrill can be efficiently used in (1) drilling deep intervals, (2) drilling low-pressure pay zones, and (3) drilling out cement, deepening of the hole and other remedial operations.

Explosion drilling . . . To increase penetration in deep wells or deep hard-rock intervals, a continuously controlled explosion drilling process has been developed which eliminates use of mechanical rock-crushing tools.

The method consists in the destruction of hard rock to make a hole by means of underwater blasting of special explosive charges. The charges are run at a predetermined rate into the drill pipe by the flow of the drilling fluid. They explode at the same rate on the bottom of the hole.

A sphere of destruction is formed in the rock adjacent to the bottom of the hole due to the underwater explosion. The sphere may be schematically subdivided into three basic zones differing in the intensity of the explosion wave action and in the degree of rock destruction.

Fig. 8 shows these zones after two successive explosions, designated 1 and 2. The destruction of the rock within the zones of crushing (A_1A_2) and predestruction (B_1B_2) is the result of the mechanical action of compression and tensile forces originating in the massif due to the immediate delivery of the compressed gas energy to the rock.

Fracturing in the zone of hydraulic action (C_1C_2) results mainly from repeatedly arising alternating strains caused by shock waves propagating in the fluid at the time of the explosion. The repeated action of the explosions results in separating relatively large fragments from the rock massif. The size of these fragments is large enough for use as rock samples.

The forming of the hole is the result of the combined action of repeated underwater explosions. Drilling progress is principally connected with the brisant action of the charge in the zone of crushing, the diameter of the hole being dependent on the rock breakdown in the zone of hydraulic action.

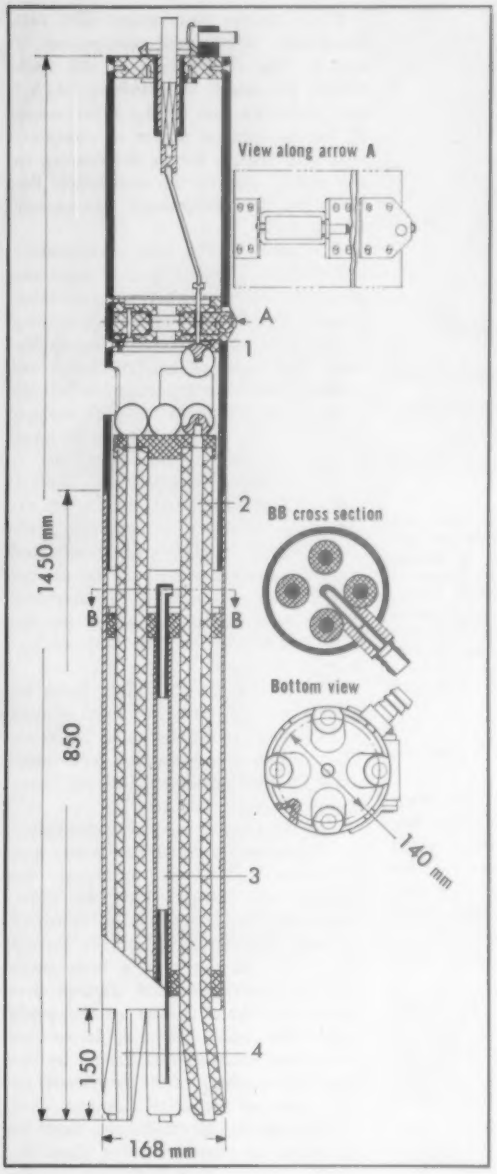
The possibility of drilling holes by means of explosions has been proved in field tests at depths up to 2,800 m. The maximum continuous well interval drilled by explosions in hard formations is about 300 m.

The maximum rate of penetration by explosions in hard limestones and dolomites was 16 m. per hour, the average rate being 3-5 m. per hour. Penetration rate depends on depth of the well and character of the formations. The diameter of a hole made by explosions does not depend materially on the diameter of the pipes used. This makes it possible to isolate zones causing difficulties by intermediate casing and to obtain an open hole of required diameter.

Thus favorable conditions may be provided for penetration of deep intervals using conventional muds, water, and even air. It should be noted that a hole of the minimum size permitted by diameter requirements for production (for example 6 in. and less), may be made by explosion drilling.

Vibration method . . . When the vibration method of drilling is used the destruction of the rock is achieved by frequent impulses of force transmitted to the rock through the bit blades, teeth, or inserts. These impulses are usually within a low frequency range.

Lab tests prove that a combination of rotary drilling and sufficiently intensive vibrations or frequent thrusts increase penetration rate and meterage per bit. This may be explained by the fact that the destruction of a for-



TANGENTIAL DRILL consists of four positive electrodes mounted on the housing, the lower part of which has cuts forming four negative electrodes. Positive electrodes are numbered 2 on the drawing; number 4 refers to negative electrodes. There are air-gap balls at the upper ends of the electrodes. A discharge ball placed above them rotates around the drill axis (rotating mechanism shown at 1) approaching in turn the lower discharge balls and successively forming spark gaps with each of these balls. The centrally located pipe (3) supplies liquid to the bottom of the hole.

mation is effected due to stronger forces without intensive sliding of the bit on the bottom hole.

If cone bits are used the abrasive wear of the cone bearing is also reduced as the bit rotates at low r.p.m. when the cone bearings are unloaded or cones raised above the bottom hole.

The first experimental bottom-hole vibration-powered drills are designed as hydraulic ones for drilling 5¾ and 11¾-in. holes. They are mounted in place of turbodrills and the rotation of the bit at low speed is effected by means of a rotor from the surface.

On one of the vibration drill models tested under field conditions, the bit is subjected to impacts of a heavy rod valve continuously vibrated by the drilling fluid.

The tests revealed the necessity of installing, above the vibrator, a special damper, protecting drill pipes from unwanted vibrations.

Field tests proved the expediency of vibration drilling even with cone bits. In many cases meterage per bit up to 150 m. was obtained in lime rock, the penetration rate being about 15 m. per hour.

To insure full-scale application of vibration drilling in the industry it is necessary to improve designs of the drills, increase their power, and extend their life. Simple monolithic bits should be used in vibration drilling instead of cone bits. Such monolithic bits are being tested under laboratory conditions. They provide high penetration rates, exceeding those achieved with cone bits.

Drilling by electric discharges . . . The method of rock destruction by means of electric discharges in a liquid medium is based on an effect (similar to an explosion) which takes place when the space filled with the liquid between the electrodes is broken through by a high voltage discharge.

This complex phenomenon consists of electrical effects resulting from energy release in the discharge channel, and mechanical effects due to the generation and propagation of shock waves in the liquid and their action on the solid body.

An experimental model of the tangential drill consists of four positive electrodes mounted in the housing whose lower part has cuts forming four negative electrodes. There are air gap balls at the upper ends of the electrodes. A discharge ball placed above them rotates around the drill axis approaching in turn the lower discharge balls and successively forming spark gaps with each of these balls.

Laboratory tests of the tangential drill in numerous blocks of different rocks showed that the spudding in of the hole begins with forming an annular groove.

When using a tangential drill about 170 mm. in diameter the hole size was 220-250 mm. Penetration rate at power consumption about 6-7 kw. was equal to 0.5 cm. per minute. Power consumption per one discharge was about 100 kg.-m. while energy release from the condenser was equal to 32 kg.-m. Thus the efficiency of the unit did not exceed 30%.

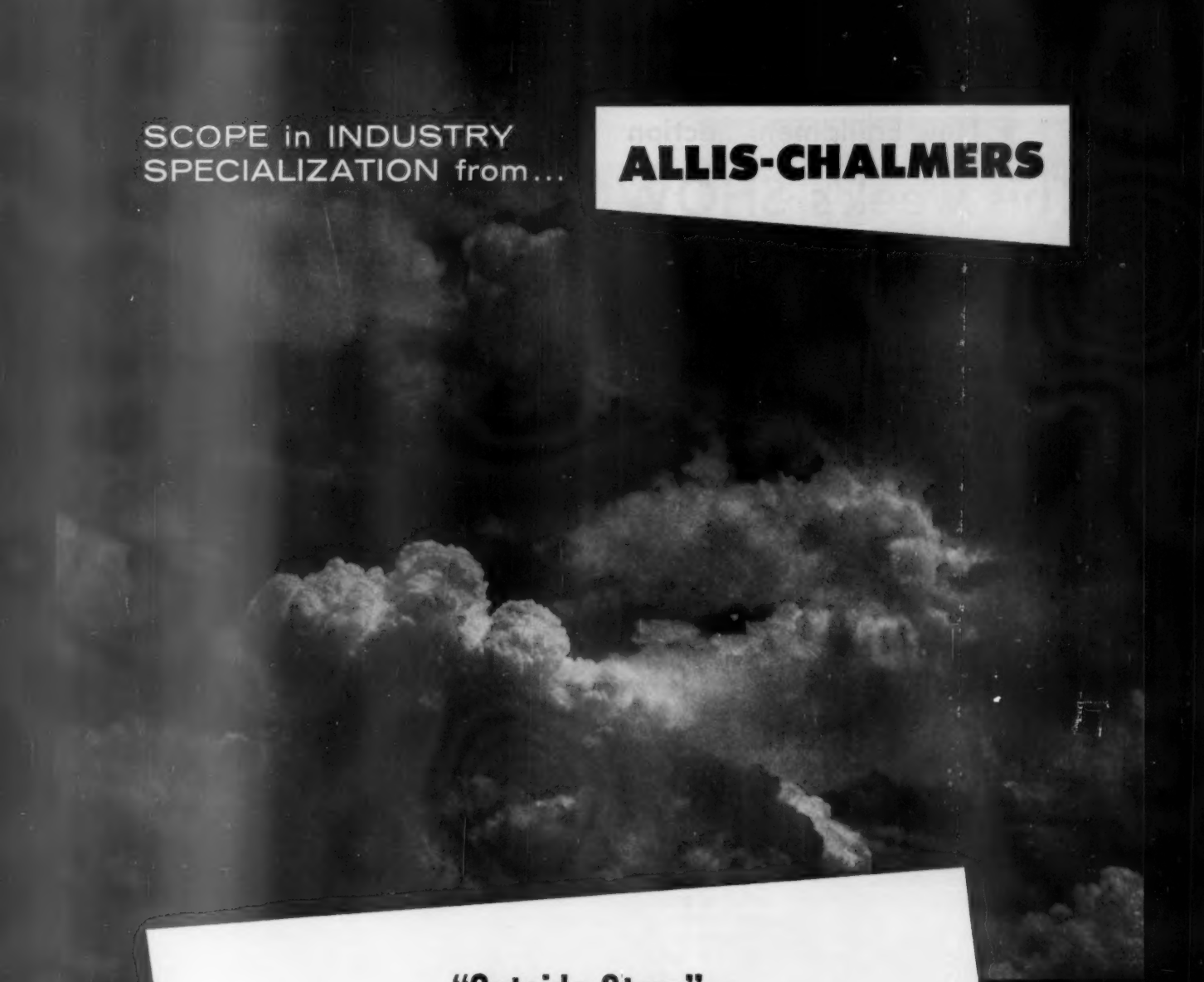
However, specific energy capacity of the dolomite destruction process was 150-500 kg.-m./cc. in spite of the low efficiency of the drill.

Research work carried out to investigate friction in the turbodrill thrust bearing has led to the development of rubber-metal thrust bearings working in a fluid medium. In the medium of real drilling fluids, friction losses in such bearings approach those in roller bearings.

The use of plastic materials for manufacturing turbodrill parts instead of steel castings has reduced turbodrill cost in spite of a considerable increase in stages. This resulted in a material improvement of hydrodynamic characteristics and erosion resistance of the turbines.

Drilling with diamond bits guarantees large meterage per bit; however it is impossible to obtain faster drilling progress in deep wells if penetration rates are low. Tests have shown that an increase in circumferential velocity up to 20 m. per second does not affect diamond-bit wear resistance.

Turbodrilling with diamond bits is especially promising in slim-hole drilling where the development of long-wearing, small-size cone bits is the most complex problem.



SCOPE in INDUSTRY
SPECIALIZATION from...

ALLIS-CHALMERS

an "Outside Story" about Allis-Chalmers products

Self-protection against weather is built into a variety of Allis-Chalmers products — electrical or mechanical. This "Outside Story" through a broad range of A-C equipment (and only A-C offers such a scope of outdoor products) *eliminates the need for costly protective enclosures in many operations.*

Pumps, motors, compressors, mechanical drive equipment, control and switchgear with inspection alleys — all are designed to perform 'round the calendar while exposed to the elements.

For single-source availability of a tremendous scope of up-to-date equipment, designed for outstanding quality control, contact your A-C representative. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

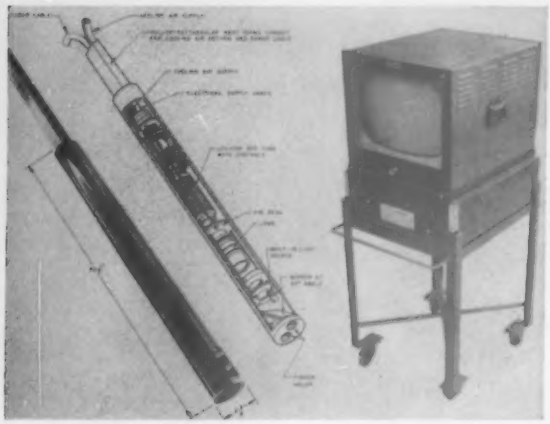
Products for Petroleum: Electrical Generation and Distribution Equipment; Pumps (rotary vacuum and centrifugal); Compressors; Motors and Control; Mechanical Power Transmission Equipment; Water Conditioning Systems, plus Materials Handling Equipment.

A-C ALLIS-CHALMERS

A-5917-P

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .



2¾-In TV camera inspects pipe

. . . and tubing. Called the Pencil, the TV camera was developed to permit an inspection of welds inside of 3-in. diameter reactor tubes. The camera mounts on a handle of rectangular tubing which is the means of moving and rotating the camera inside of a tube to make the inspection. A tube inside the handle supplies cooling air to the camera. The handle also carries the camera power cable and forms a duct for exhausting cooling air from the camera.

The 17-in. television monitor and camera control power unit complete the TV inspection system. These two units mount on a cart, making the equipment easy to move to an inspection site. Since any defects are enlarged on the television screen, the inspection system permits an accurate analysis of tube conditions quickly. SOURCE: **Electronics Div., Diamond Power Specialty Corp., Dept. OGJ, Lancaster, Ohio.**

●

Data processor widens computer use

. . . by providing automatic communication of programs and computer results between a central computer and as many as eight remote locations. The new Multiplexer 1010 offers a way to overcome scheduling problems and inefficiencies where a central computer is used by more than one department.

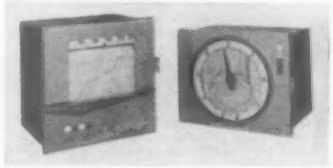
Two particularly important features are individual access from remote locations and override control by the computer manager. The equipment controls give three operating modes: (1) free access to the computer by any remote station, (2) priority access by one remote location, and (3) access by computer personnel only. SOURCE: **Vitro Laboratories, Dept. OGJ, 200 Pleasant Valley Way, West Orange, N. J.**

●

String-a-lights for drilling rigs

. . . have been redesigned. Assemblies can be combined to form vaporproof lighting sets to fit rigs using most masts or derricks. The string-a-lights offer a number of features. The latching connectors are made of neoprene to eliminate corrosion, the floodlights are compact, and the mounting clamps are adjustable to give considerable flexibility in lighting a rig.

Heat-treated glass used on the lamps is not affected by abrupt temperature changes. The neoprene assemblies resist oil, acids, water, ice, and dust. SOURCE: **Joy Mfg. Co., Electrical Products Div., Dept. OGJ, 1201 Macklind Avenue, St. Louis.**



Pencilled graph controls programer

. . . just unfolded. The instrument, called Prekorder, is a combination programer, indicator, controller, and recorder. It simultaneously "reads" a pencil-drawn chart, controls a process accordingly, then superimposes a record of process performance on the same chart. Though appearing somewhat like a conventional recorder, it

Send this Showcase Coupon

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

Described in OIL AND GAS JOURNAL - Issue of September 14, 1959

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

PICKLED in a 4% brine solution!

CHOKED
in a tornado of abrasive dust!

FROZEN
for weeks at 75° C below zero!

BURIED ALIVE
in thick, sluggish mud!

nothing . . . but nothing stops Super-Seal open-type motors

Thanks to exclusive Poxeal and Silco-Flex insulations, Super-Seal motors have shown endurances that even enclosed motors couldn't match. Results and reasons available from your A-C representative or distributor. Or write General Products Division, Milwaukee 1, Wisconsin

ALLIS-CHALMERS A-C A-1151

Poxeal, Silco-Flex and Super-Seal are Allis-Chalmers trademarks.

New Equipment

is considerably different as it has no cams, cam followers, or function generators.

The program appears as a double-line graph, pencilled directly on the recording chart. The controller senses any deviation of the recording pen from the middle of the pencilled graph then regulates the process to oppose the deviation.

Process programing is easy. Merely draw a double-line graph of desired program on ordinary chart paper. To change the program, just erase and redraw the graph.

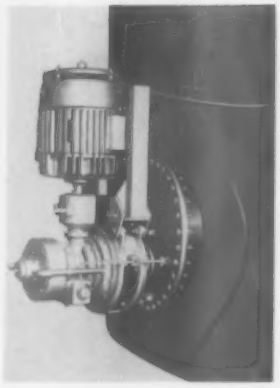
The two parallel pencil lines that define the process program are connected electrically to the two ends of a center-tapped transformer winding that serves as a voltage source for an electrostatic field between the lines. The recording pen also serves as a capacitive probe. It picks up an error signal proportional to any deviation of the pen from its null position midway between the program lines. This error signal is used to effect a readjustment of the process to ultimately recenter the recording pen. SOURCE: **Research, Inc., Dept. OGJ, 115 North Buchanan Street, Hopkins, Minn.**

●

Tool serves as packer or anchor

. . . for tubing. This latest development in drilling and production equipment can handle a variety of jobs. Full-opening and retrievable, it can be used as a weight-set packer, tension-set packer, tension tubing anchor, and a tubing catcher. It's convertible to any of these functions at the well.

The Cam-Lok tool can be set in tension to take advantage of pressure from below when testing, waterflooding, fracturing, and acidizing, or in shallow wells where the tubing weight and casing fluid column may not be enough to hold the packer weight set against the high bottom-hole pressure. It can be used as a packer during the flowing life of a well. Then when the well goes on pump, the tool can be converted to a tubing anchor. SOURCE: **Brown Oil Tools, Inc., Dept. OGJ, 8490 Katy Road, Houston.**



New side-entering mixer is compact

. . . and has less overhang than many mixers used presently. It weighs less too. Weights vary from 505 to 575 lb., less the weight of the motor, on models with ratings from 5 to 25 hp.

One prominent feature is that the mixer can be set at a 20° angle, right or left, within the tank. Propeller turns at 425 r.p.m. SOURCE: **Jensen Engineering Co., Dept. OGJ, Box 4507, Tulsa.**

●

Smaller o. d. tubing joint perfected

. . . to provide an economical solution to installing tubing in multiple-completion wells with limited clearance. The new coupling for 2⅜-in. tubing is machined down to an outside diameter of 2¾ in. This compares with an o.d. of 3 1/16 in. on standard API threaded-and-coupled tubing.

The tubing is described as being suitable for use in wells with average pressures. When both pipe and coupling are of the same grade, joint efficiency is nearly 100%. For greater joint efficiency, the use of couplings one grade higher than that of the pipe is recommended by the maker. The tubing will be available in Grades H-40, J-55, and N-80 in only a 2⅜-in. size. SOURCE: **Jones & Laughlin Steel Corp., Dept. OGJ, Three Gateway Center, Pittsburgh 30.**

●

Compact, portable seismic system

. . . newly developed is a 24-channel transistorized system complete in two units. It provides high-fidelity frequency modulated recordings on SIE standard magnetic tapes from the output of conventional geophysical amplifiers.

The PMR 20 portable FM magnetic recording system consists of a 50-lb. transport that houses the recording drum, drive system, and fixed or movable recording heads, and a 40-lb. master unit in which modulators, demodulators, and auxiliary equipment are contained.

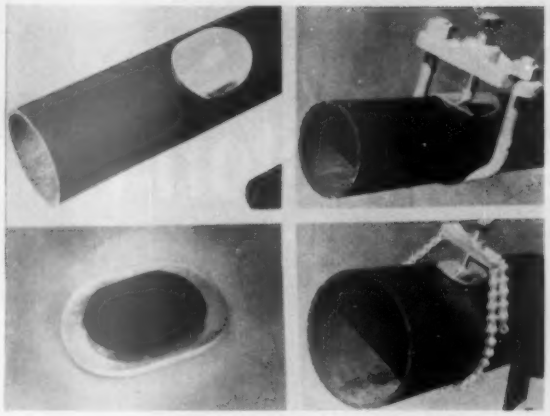
Besides the 24 seismic channels, the system includes information channels for time break, uphole, noise canceling, and 100-c.p.s. timing reference. You can read recording and playback modulation levels directly from the front panel meter. SOURCE: **Southwestern Industrial Electronics Co., Dept. OGJ, Box 13058, Houston.**

●

Inflatable metal tubing developed

. . . recently holds promise for providing a corrosion-resistant lining for pipe and vessels in petrochemical plants and refineries. The development is called Strubing for strip tubing. The tubing is produced in ribbon form and inflated at the point of use. For example, it can be inserted in a pipe or vessel and inflated to form an inner liner.

Tubing can be made in virtually any diameter. SOURCE: **Wolverine Tube Div., Calumet & Hecla, Inc., Dept. OGJ, 17200 Southfield Road, Allen Park, Mich.**

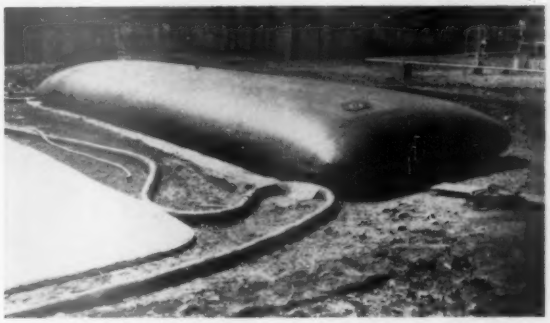


Pipe Patch eases leak repair

... as it permits repair of pipe leaks without shutting a line down. The new development for pipeliners is individually contoured to fit each pipe size. To repair a leak, simply place the patch with its bonded neoprene gasket over the leak and apply the repair tool to hold the patch in place. When enough pressure is applied to the patch by the tool, the leak is sealed off.

Once the leak is sealed off, the user can easily weld the patch on the pipe for a permanent repair, or leave the tool in place for a temporary repair. The tool can be reused many times.

The Pipe Patch tool, a hold down clamp, comes in two types. One is a saddle type for ¾ through 6-in. pipe. The other is a chain type for larger sizes—up to 36 in. SOURCE: **M. J. Crose Mfg. Co., Inc., Dept. OGJ, P. O. Box 3368, Tulsa.**



Collapsible tank to store 200,000 gal.

... of liquid is now being made. Previously available in sizes to 50,000 gal., the larger tank extends the opportunity to use pillow type of tanks to reduce tank transportation and installation costs.

The tanks are relatively lightweight and easy to handle. They can be rolled up like a rug when not in use. And they can be overloaded by as much as 25% without being damaged. With the exception of acids, the tanks can store most liquids. Storage temperatures can range from −40° to 165° F.

The tanks consist of one or two plies of synthetic-rubber-coated nylon. When two plies are used, the outer ply consists of nylon cloth coated on both sides with gasoline-resistant synthetic rubber. The inner ply consists of a similar but lighter ply of nylon cloth.

A 200,000-gal. tank measures 124 ft. long, 38 ft. wide, and weighs about 2 tons. SOURCE: **Goodyear Tire & Rubber Co., Dept. OGJ, Akron 16, Ohio.**

●

Filter of tiny metal spheres

... of platinum or palladium welded together into pads has been perfected for use in chemical processing and missiles. One big advantage of the

READ THESE FACTS ABOUT THE NEW HAMER D SERIES HIGH PRESSURE PLUG VALVE

1. **No adjustments needed.** There's no taper to adjust. It's the first successful high pressure valve using a cylindrical plug.
2. **Plug can't stick or freeze.** Elastomer backing on seat segments permits micro-floating effect. Design insures free-turning plug under all operating conditions.
3. **Can be rebuilt right in the line in 10 minutes.** Low-cost factory replacement part kit permits reconditioning the valve to like new efficiency.
4. **Parts reversible**—can't be installed backwards. Seat segments may be turned end for end and still fit properly. Also parts are interchangeable within any given size.
5. **Valve weighs less, costs less**—approximately 40% lighter than similar service valves. It is smaller in size. And it costs 20% to 40% less than similar service valves.

Hamer VALVES
P. O. Box 1851 • 2919 Gardenia Ave., Long Beach 1, California
Division of Chikson Company
Please send me your Catalog D4.
Name_____
Address_____
Company_____
Title_____
City_____ Zone____ State_____
*59-5

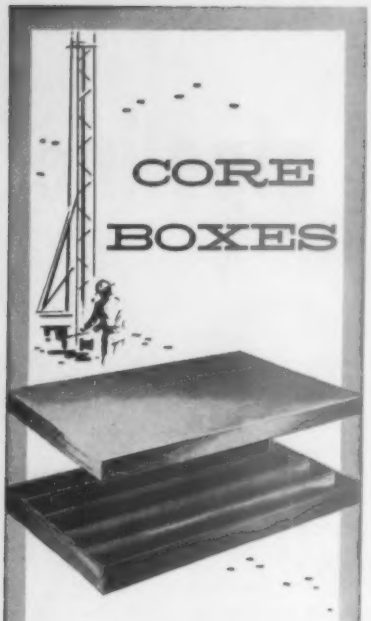
From the Persian Gulf to the Mediterranean . . .

AAF cleans dust-storm air

Trans-Arabian Pipe Line Co.'s portable gas-turbine pumping unit at Jalamid, Saudi Arabia, operates unattended—though far out on the hot, dusty desert! 5000-hp turbine drives 5200-rpm centrifugal pump (in van, top of fenced-in area). Clean air from AAF filters is provided for turbine and control rooms.

along 1000-mile desert pipeline!

SYRIA
LEBANON
IRAQ
JORDAN
SAUDI ARABIA
KUWAIT
Persian Gulf
QATAR
LEGEND
PERMANENT DIESEL PUMPING STATION
PERMANENT TURBINE PUMPING STATION
AUXILIARY PUMPING UNIT
Qaisumah Pump Station
Rafha Pump Station
Badanah Pump Station
Turaif Pump Station
Dhahran
Ras Tanura
Abqaiq
Qatif
Hofuf
Safaniya
Khafji
Mina al Ahmadi
Ras al Mishab
Ju'aymah
Tanajib
Wadi al Batin
Hafar al Batin
Nariya
Hawiyah
Haradh
Uthmaniyah
Ain Dar
Shedgum
Udhailiyah
Fadhili
Abu Hadriya
Berri
Zuluf
Marjan
Safaniya
Khursaniyah
Manifa
Arabian Light
Arabian Heavy
Arabian Medium
Abu Sa'fah
Manifa
Abu Ali
Ras Tanura
Juaymah
Qatif
Abqaiq
Dhahran
Ras al Mishab
Safaniya
Khafji
Mina al Ahmadi



CORE BOXES

COMPLETELY ASSEMBLED AND READY FOR USE

- Each box holds 10 feet of core.
- Constructed from rugged, 200-lb. test corrugated board.
- Each box printed on the end with the following:

HOLE_____ FROM_____

TO_____ BOX NO._____

SPECIFICATIONS

	Length	Width	Depth
AX Core Box	24 x	8¼ x	1⅜
BX Core Box	24 x	9½ x	1¾
EX Core Box	24 x	7 x	1⅛
NX Core Box	24 x	12 x	2¼
2½" Core Box	24 x	13⅞ x	2⅝

Custom-Made Boxes for Any Size Core.

GENTLEMEN: PLEASE SEND CATALOG SHEET AND SAMPLE CORE BOX

THE LOVE BOX COMPANY, INC.
700 E. 37th St. North
P. O. Box 546 Wichita, Kansas

Name_____

Address_____

City_____ State_____

Core Size_____

filter is that it has high resistance to corrosion and high temperature above 3,000° F. If necessary, the filter can be cleaned in aqua regia, a mixture of nitric and hydrochloride acids.

An atomization process is used to produce the metal spheres. Molten metal is sprayed to break it up into tiny uniform drops. Pore sizes from 5 to 40 microns can be obtained with an accuracy of ± 10%. The maker points out that, since the components are welded together, the filters have greater structural strength than either compressed-powder or ceramic filters. Porosity of the filters ranges from 25 to 35%. Filter shape can be rectangular up to 3 by 8 in. or disk up to 3½ in. in diameter. SOURCE: **Baker Platinum Div., Englehard Industries, Inc., Dept. OGJ, 904 Passaic Avenue, East Newark, N. J.**

●

Level gage uses servo motor

. . . to drive a displacer up and down in and out of the liquid being gaged. This newly developed gage, Dynamatic Fig. 8400 Series, is adaptable for all types of cone roof, floating roof, and underground tanks. It is available for pressures up to 50 psi. on tanks of any diameter and up to 60 ft. high.

Accurate to 1/16 in. in a 60 ft. working range, the gage employs no floats, counterweights, or spring balances. Instead, electrical power is used to drive the indicating mechanism. The measuring device consists of two elements. One is a force-measuring mechanism consisting of a torque tube, arm, and contact. The other is a displacer consisting of a solid plate of any material suitable for the environmental conditions. It is partially submerged in the liquid to be measured and driven up and down by a reversible two-phase servo motor in response to changes in liquid level. When remote gaging is desired, the gage can be equipped with either a pulse code or electronic remote-reading system. Since the servo motor runs constantly to maintain displacement balance, it acts as an automatic operation checker. SOURCE: **Vapor Recovery Systems Co., Dept. OGJ, 2820 North Alameda Street, Compton, Calif.**

●

Pump control works in bad weather

. . . as it has an enclosure with a corrosion-resisting finish and a sealed inner compartment to protect the operating parts. A built-in lightning arrester protects the oil-well pump control from damage in electrical storms.

Exceptional features of the control circuit include automatic and adjustable time-delay restarting that lets you stagger restart of several pumps in the event of power outage. Also the overload relays are ventilated so they operate at the same ambient temperature as the motor, avoiding nuisance trips. Though the overload relays are factory set for automatic reset, you can change them in the field for hand reset if desired.

MR. SUPERINTENDENT
STOP
PIPELINE LEAKS
INSTANTLY

WITH PIPE GASKET PATCH
BY DALLAS

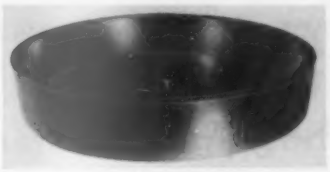
WRITE FOR FREE LITERATURE AND INFORMATION ABOUT 25' TEST ROLL.

"Used by the largest Pipelines & Oil Companies."

DALLAS MFG. COMPANY
3505 GREENBRIER DRIVE
DALLAS, TEXAS

SOURCE: **Square D Co., Dept. OGJ, 4041 North Richards Street, Milwaukee 12, Wis.**

●

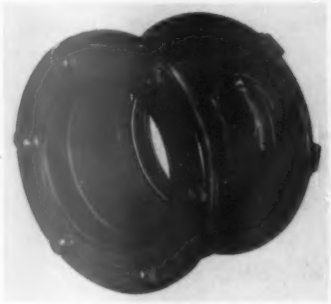


Pipeline scraper cup takes wear

. . . and tear and is designed to do away with high stress points by distributing stress evenly over a wide cup area. This provides strong resistance to breakage during pig runs.

Made in cup diameters of 2 through 36 in., the Tapseal cup has been thoroughly tested. SOURCE: **T. D. Williamson, Inc., Dept. OGJ, P. O. Box 40, Tulsa 2, Okla.**

●



Couplings for mill-wrapped pipe

. . . have been brought out that are precoated and preassembled at the factory. The maker says the permanent coating assures a superior bond and a toughness equal to the best mill-wrap specifications. Installation is easy. Just stab the pipe ends into the coupling and tighten the nuts.

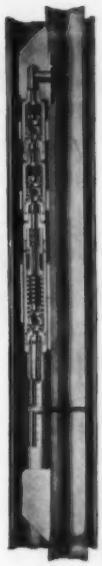
The Stab-Clad Style 123 coupling has a gasket and integral-bond wire that provide electrical continuity. It has been extensively field tested and is made in 2 through 12 in. i.d. Results of the field test indicate the coupling offers a way to sharply reduce installation costs of mill-wrapped pipe. SOURCE: **Dresser Mfg. Div., Dept. OGJ, Bradford, Pa.**

●

Catalyst promises better results

. . . in pretreatment of catalytic reforming feedstocks for contaminent removal, especially nitrogen and sulfur. The Type S-4 Hydrogen catalyst was developed for use in Unifining and Hydrobon processes. It is a nickel-containing type. Other uses include treatment of intermediate oils to improve color and storage stability and to reduce sulfur. The catalyst is fully regenerable.

The maker reports that the catalyst's activity in nitrogen removal is almost twice that of older catalysts. Increased nitrogen removal from feedstocks gives definite improvements in catalytic reforming. Because of lower density, less catalyst is needed than with older types. Too, the catalyst has greater heat stability and lasts longer. SOURCE: **Universal Oil Products Co. Dept. OGJ, 30 Algonquin Road, Des Plaines, Ill.**



Patented

TRADE MARK
TIME TESTED
MACCO
GAS LIFT
REG U S PAT OFF

BOTTOM HOLE CHEMICAL INJECTION VALVE
MACCO "Outside Mounted" Chemical Injection Valve Assembly

This valve affords an effective and proved method of inhibiting corrosion **by adding exactly controlled amounts of chemical inhibitors into the tubing...** without losses, regardless of pressure conditions or pressure variations inside the tubing. This is accomplished by pumping the inhibitor into the annulus (filled with 40 parts carrier fluid to 1 part inhibitor, for example) and forcing it through the chemical-injection valve set above a packer. Since this system is hydraulic, the quantity entering the tubing will be the same as the quantity pumped into the annulus at the surface. Thus, varying pressure conditions inside the tubing do not affect the amount of inhibitor injected. This method provides protection for three surfaces in one operation—the inside and outside of tubing plus the inside of the casing. (This process is fully patented by Macco Oil Tool Company, Inc.)

Write for additional literature or information.

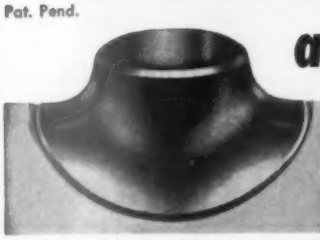
MACCO OIL TOOL COMPANY, INC.
Phone UN 1-1253
1521 Prince P. O. Box 7288 Houston 8, Texas

BONNEY SWEEPOLETS®

WRITE FOR CATALOG S-1

Pat. Pend.

are SWEEPING the pipeline industry



BONNEY

BONNEY FORGE AND TOOL WORKS / ALLENTOWN, PA.

The best Control System

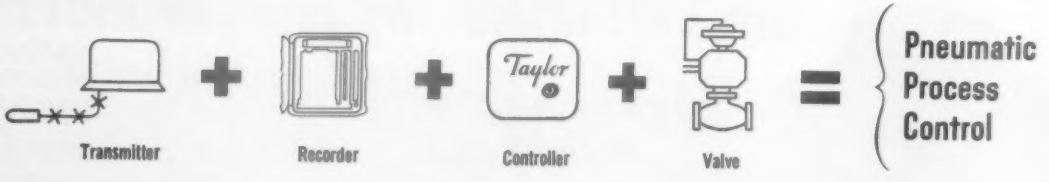
is the one

Taylored

to your Control Problem

INSTRUMENT SOCIETY OF AMERICA

PNEUMATIC SYSTEMS



475 years of Cumulated Experience will be at Your Service in Taylor Booths 444 and 545 at the ISA Show

WHETHER you are interested in a complete control system, or in one of our new developments, the team of top Taylormen listed here will be at the ISA Show in Chicago to consult with you.

Drawn from our Application Engineering, Design Engineering, and Sales Departments, these men have behind them many years of experience in instrumentation throughout the processing industries. They are responsible for the enviable reputation that Taylor is earning around the world . . . a reputation for vision and ingenuity in working out successful solutions to tricky control problems.

You will see the most advanced models in both pneumatic and electronic instrumentation on display. Many of them will be demonstrated as working models.

Here is an opportunity to tap a storehouse of information on all aspects of process control. Consultation with these men will cost you nothing—it may save you much.

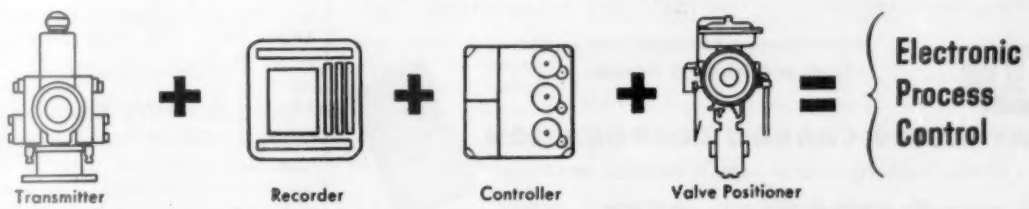
• • •

Taylor Instrument Companies, Rochester, N. Y. and Toronto, Ont.

R. L. ANDERSON
D. C. BAER
F. G. BARCLAY
E. M. BARR
W. J. BERK
E. R. CAMPBELL
R. E. CLARRIDGE
J. A. EDWARDS
R. A. ELLIS
L. L. FORWARD
W. C. GRAY
J. B. HAMILTON
G. E. HELLER
R. W. HOFFMAN
G. E. HOWARD
H. A. HUNT
S. J. JESATKO
S. LEVY
G. B. LINT
J. L. McGEE
N. B. NICHOLS
C. W. OHGREN
R. N. POND
R. B. REYNOLDS
J. W. RYAN
D. B. SCRIVENS
E. J. SHEARE
B. C. STINSON
H. W. STOLL
E. B. SUTHERLAND
J. W. THOMAN
J. G. ZIEGLER

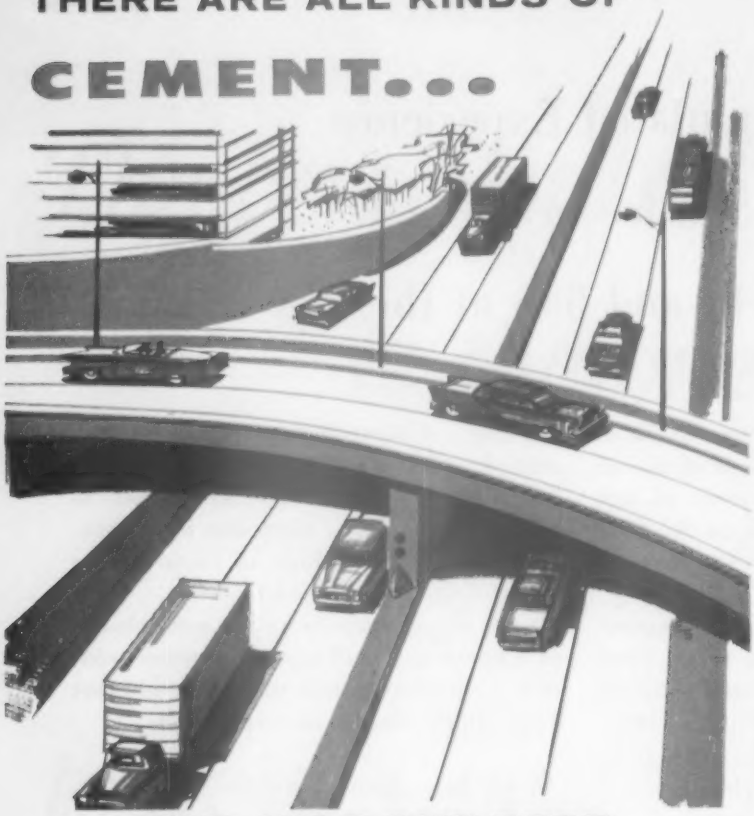
Taylor Instruments **MEAN ACCURACY FIRST**

ELECTRONIC SYSTEMS



THERE ARE ALL KINDS OF

CEMENT...



BUT JUST ONE BEST

CEMENT ADDITIVE

FOR OIL WELLS!

ONLY Strata-Crete 6

® TRADE MARK

GIVES YOU ALL 6 !

Lower fill-up cost, generally, than neat cement
Easier to place, requires only normal pump pressure
Resiliency to reduce fracturing and shattering
Superior bridging qualities with lighter weight
Can be used with any brand of oil well cement
Not affected, in itself, by high well temperatures

Strata-Crete 6 can be obtained from your oil well cementing service company.

GLC

GREAT LAKES CARBON CORPORATION

MINING & MINERAL PRODUCTS DIVISION — STRATA PRODUCTS DEPARTMENT

1404 NIELS ESPERSON BUILDING HOUSTON 2, TEXAS

SHOWCASE . . .

New Literature

Radioactivity monitoring systems

. . . for detecting, measuring, and recording radioactivity are offered in new 16-page Bulletin M-59. The literature, which may be obtained by filling out and mailing the enclosed reply card, describes: (1) seven particulate monitoring systems; (2) five detectors; (3) a portable air and area monitor; and (4) a diagram of a typical remote monitoring system for a reactor site.

Featured is a new system that solves the natural radon-progeny problem by providing direct identification of long half-life emitters almost immediately, with a single detector. SOURCE: **Nuclear Measurements Corp., Dept. OGJ, 2460 North Arlington Avenue, Indianapolis 18.**

Seamless drill-pipe brochure

. . . provides information on drill-pipe weights, sizes, and grades. The eight-page literature includes charts which show physical properties, dimensional, torsional, collapse, and tensional. It adds illustrations of upset drill pipe for attachment of welded and threaded tool joints. SOURCE: **Youngstown Sheet & Tube Co., Dept. OGJ, 1954 Stambaugh Building, Youngstown 1, Ohio.**

Bulletin details metal packings

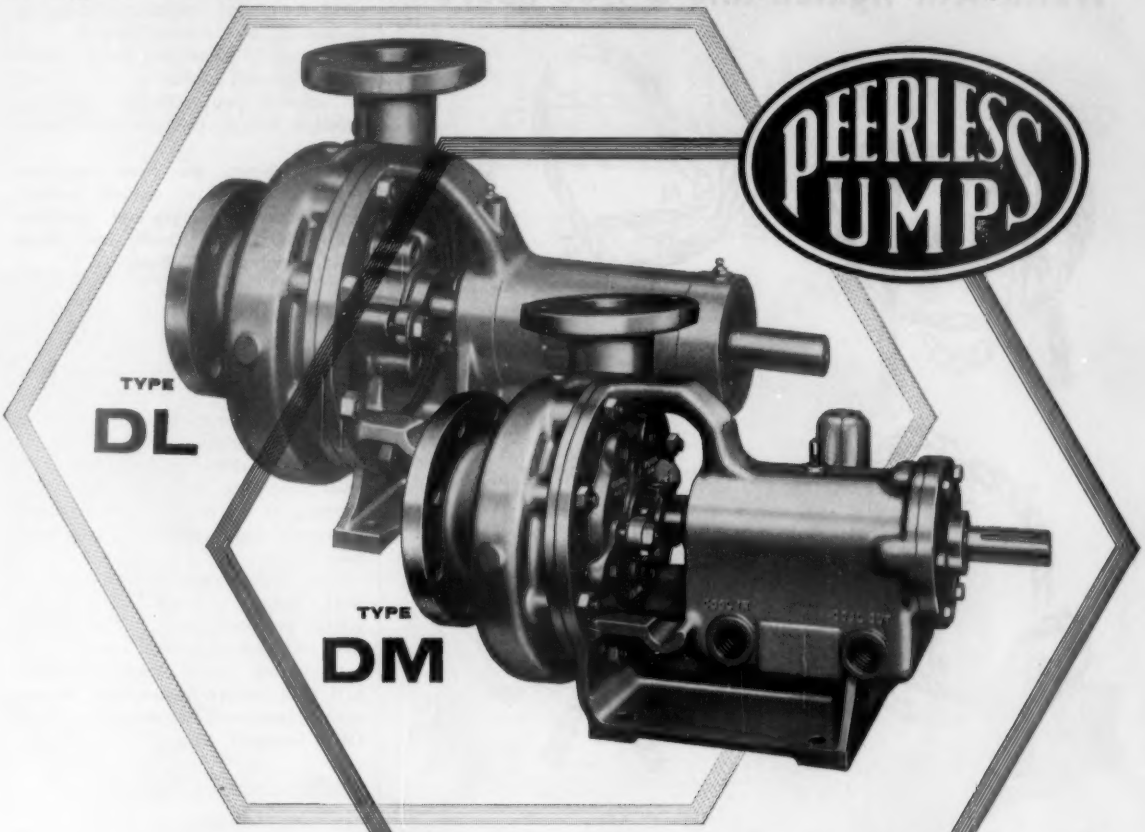
. . . for pumps, engines, and compressors. The new 24-page literature contains data for correct selection, application, and installation of packings, and is complete with explanatory illustrations.

Bulletin AD-166 describes: (1) free-floating metal packing, taking in detail the annular solid-cup type, high-pressure packing, and the split-case multigroove type; (2) metal-rod packing rings, metal scraper rings, metallic or nonfloating packing, and piston rings; and (3) testing and service facilities available to assist users in selecting and maintaining metal packing. SOURCE: **Garlock Packing Co., Dept. OGJ, 438 Main Street, Palmyra, N. Y.**

Hydraulic-valve manual

. . . illustrates and describes the operation and application of valves which are pressure-controlled. The new 20-page publication contains complete in-

Mr. Engineer: Cut Your Pump Inventory—Reduce Costs With These New, Proved Pumps



a new concept of economy through interchangeability of components!

PEERLESS PUMPS

INTEGRATED DESIGN

∫ SUPERIOR DESIGN + TOP QUALITY CONSTRUCTION + MAXIMUM INTERCHANGEABILITY + OPTIMUM MATERIAL GROUPS AVAILABLE

= BROADEST HYDRAULIC COVERAGE WITH MINIMUM CUSTOMER INVENTORY OF PUMPS AND COMPONENTS

ACCESSIBILITY—Through ease of assembly and disassembly if and when required. **DURABILITY**—Through use of any machinable metal as materials of construction. **SERVICEABILITY**—Through designs that feature maximum ease of maintenance. **INTERCHANGEABILITY**—Through a choice of semi-open or enclosed impellers, oil or grease lubrication, air- or water-cooled back plates and bearing housings. **RELIABILITY**—Through the high performance standards set for these pumps, proving more than ever before, that Peerless Builds Dependable Pumps. **AVAILABILITY**—Shipment from stock of both complete pumps and pump components.

CAPACITIES: UP TO 1000 GPM • WORKING PRESSURE: UP TO 300 PSIG
HEAD RANGE: UP TO 430 FEET • TEMPERATURE RANGE: UP TO 450° F

Putting Ideas to Work

fmc FOOD MACHINERY AND CHEMICAL

Peerless Pump Division

Offices:
New York; Detroit; Cleveland; Chicago; Indianapolis; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno.

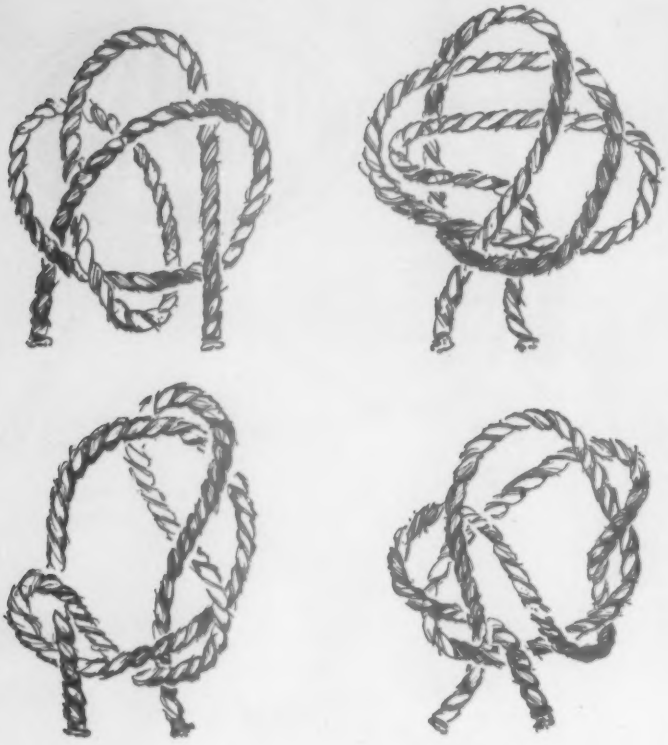
Distributors in principal cities.
Consult your telephone directory.

PEERLESS PUMP DIVISION, FOOD MACHINERY AND CHEMICAL CORPORATION
301 West Avenue 26, Los Angeles 31, California
Please send me Bulletin No. B-1608 OGJ

Name_____
Address_____
City_____
State_____

Visit us in Booth 831 during the Chemical Show, Coliseum: New York, Nov. 30 - Dec. 4, 1959

Which will tighten into a true knot?



Can you tell the real thing when you see it?

You can be sure of getting the genuine article every time when you buy chemicals made by Wyandotte! Product line of uniform quality, including materials for drilling muds, gas dehumidification, demulsifying, emulsifying, secondary recovery, water treatment, cementing, sweetening and many other petroleum, refinery, and petrochemical applications. Get full details from your distributor, or write: *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

ANSWER: This, of course, is a knotty problem. But if you selected the one at the lower left, you qualify as an expert knothead. If you didn't, perhaps you don't pull enough strings.

WYANDOTTE CHEMICALS

Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

PACING PROGRESS WITH CREATIVE CHEMISTRY

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA • CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • MURIATIC ACID • HYDROGEN • DRY ICE • GLYCOLS • SYNTHETIC DETERGENTS
SODIUM CMC • ETHYLENE OXIDE • ETHYLENE DICHLORIDE • POLYETHYLENE GLYCOL • PROPYLENE OXIDE
PROPYLENE DICHLORIDE • POLYPROPYLENE GLYCOL • DICHLORODIMETHYLHYDANTOIN • CHLORINATED SOLVENTS
OTHER ORGANIC AND INORGANIC CHEMICALS

formation on the 3,000-psi. valves, used for relief, sequence, reducing, unloading, and counterbalance.

Manual 230 discusses factors influencing correct choice of valve, such as: normal spool position, operating-pressure source, pilot or direct operation.

Also shown are flow diagrams, pressure-versus-flow curves, ratings, dimensions, drawings, and specifications. SOURCE: **Rivett, Inc., Dept. OGJ, Brighton 35, Boston.**

'How Others Do It' publication

. . . contains ideas submitted by plant engineers and electricians showing how they've used snap-action switches to increase production efficiency. Illustrated by drawings and photos, the issue contains six methods which promise to save man-hours, protect operators and machinery, and eliminate waste.

One item describes how an iron works helps cut down time and safeguards personnel by using 87 plug-in limit switches to control a mold-making, closing, and shakeout operation. SOURCE: **Micro Switch Div., Minneapolis-Honeywell Regulator Co., Dept. OGJ, Freeport, Ill.**

Nickel-containing casting alloys

. . . guide presents condensed, informative data on the range of properties offered, industries served, and general applications for each of the alloys included. A six-page foldout table at the beginning of the 30-page booklet pinpoints important properties of each alloy and its uses in various fields.

The table is followed by one-page writeups in which each alloy is treated in more detail as to composition and properties. SOURCE: **International Nickel Co., Inc., Dept. OGJ, 67 Wall Street, New York City 5.**

Brochure discusses line pipe

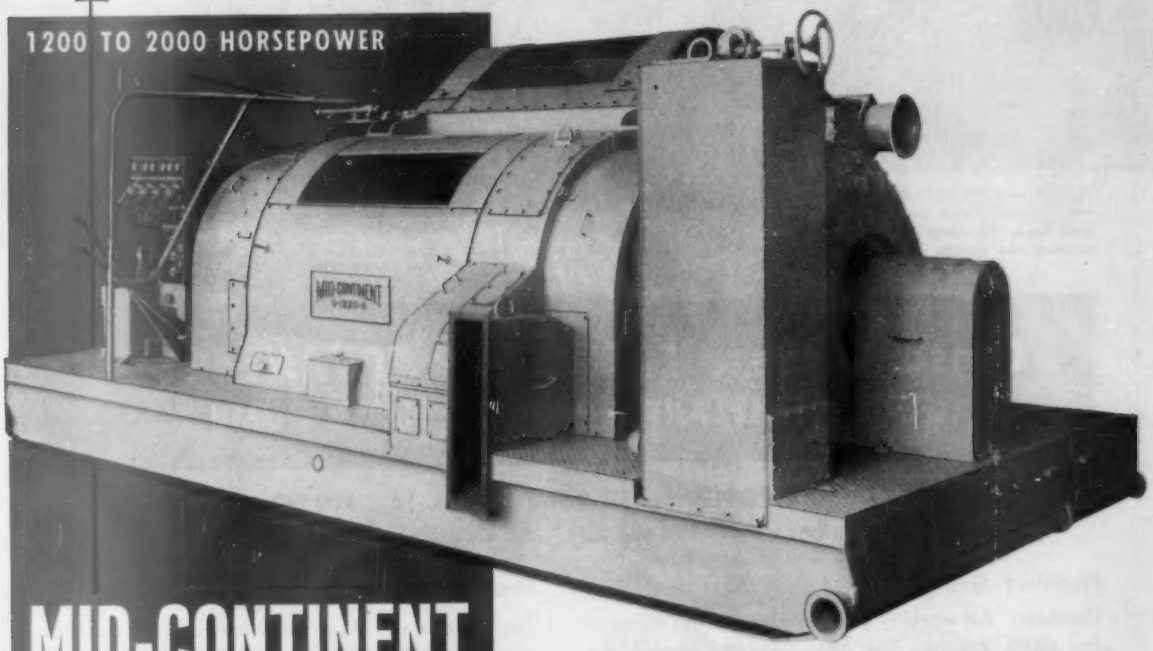
. . . manufactured by a method known as electricweld, and details various features and advantages. The new 12-page publication also describes production operations used in making the line pipe and takes the reader on a picture tour of a new electricweld pipe mill. Pictures and a complete table of specifications are included. SOURCE: **Jones & Laughlin Steel Corp., Dept. OGJ, Three Gateway Center, Pittsburgh 30.**

Heat-transfer equipment

. . . is described in new condensed Bulletin 593, which covers heat exchangers, fired indirect heaters, tank

New efficiency...

FOR TODAY'S DEEPEST DRILLING



MID-CONTINENT
U-1220-B
DRAWWORKS

The new U-1220-B Drawworks, rated at 1200 to 2000 net input horsepower, incorporates all the proven features necessary in a deep well rig, plus many new and improved features for maximum flexibility and more economical operation. For complete information, write for our U-1220-B Bulletin or contact your local Mid-Continent Representative.

- **SIX FORWARD SPEEDS** to the hoisting drum — two reverse speeds.
- **THREE FORWARD SPEEDS** to the rotary, catshaft, and optional sandreel — one reverse speed.
- **EXTRA LARGE BALANCED DRUM** — 32¼" diameter by 57" long barrel.
- **FAWICK VENTORQUE 42VC1200** hi- and lo-drum clutches.
- **DOUBLE ADJUSTMENT MAIN BRAKES** are fully equalized with 60" by 10¾" water circulating rims of roll forged alloy steel.
- **UNITIZED CONTROLS** conveniently located in a single console for greater operational efficiency.
- **GREASE LUBRICATED BEARINGS** with flood lubrication provided for chains, sprockets, and splined clutches.
- **TWO-SECTION CONSTRUCTION** to simplify rig-up and moving.

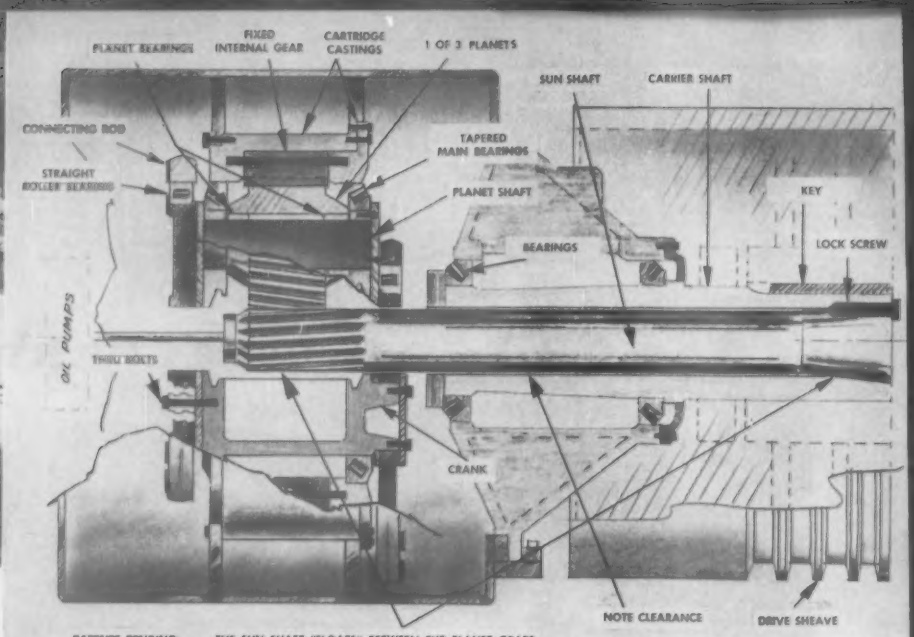
DWS-9

MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS
Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

A series of 8,000 to 10,000 foot wells in Gulf Coast and Southwest Texas show improved penetration and savings in bits.



PATENTS PENDING

THE SUN SHAFT "FLOATS" BETWEEN THE PLANET GEARS AND THE TAPERED SEAT IN THE CARRIER SHAFT.

Consider these EXCLUSIVE ADVANTAGES OF THE WHELAND HP-16000 SLUSH PUMP

WHELAND DUPLEX POWER SLUSH PUMP, 7¾" x 16", 600 HP at 65 RPM

U. S. Patent 2,649,988 and 2,717,186. Other patents pending.

Planetary Gears

Compact. All working parts contained BETWEEN the piston centers. The gear cartridge assembly easily accommodates big bearings for added life. All pumping loads carried through connecting rods to the power end are contained within the circles of the gear cartridge. Eliminates parts subject to deflection and fatigue type loads, and maintains alignment of connecting rods and bearings.

Cylindrical Crossheads

Piston-like cylindrical crossheads operating in honed cylinders are engineered to give permanent perfect alignment in every direction.

Floating Input Shaft

The sun or input shaft floats between the mesh of the three planet gears and the tapered seat in the carrier shaft for even distribution of the load. All loads from the pull of the belts and weight of sheave are carried into the steel housing independent of the sun shaft. Hence, the sun shaft transmits only the torque load to drive the pump.

Small Sheave

6.8 to 1 gear reduction permits small sheave. Note overhanging flange turned toward the pump. Pump may be driven from either side.

WHELAND

ROTARY DRILLING MACHINERY

THE WHELAND COMPANY

CHATTANOOGA, TENNESSEE, U.S.A.

DRAW WORKS • SLUSH PUMPS • ROTARIES

CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas • JONES AND LAUGHLIN STEEL CORPORATION, SUPPLY DIVISION—Main Office: Drawer 2481, Tulsa 2, Oklahoma.

EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

heaters, tank suction and line heaters, process heaters and coolers, packaged boilers, and custom-built equipment.

The predominant feature of the equipment is the Brown fintube which consists of pressure tubing to which longitudinal U-shaped channels have been resistance welded.

According to the four-page literature, the finned tube has 5 to 10 times the heat-transfer surface area of conventional tubing. SOURCE: **Brown Fintube Co., Dept. OGJ, 514 Huron Street, Elyria, Ohio.**

Industrial trucks for many uses

. . . ranging from 1,000 to 40,000-lb. capacities are illustrated in a new eight-page brochure now available. Performance data, dimensions, and equipment specifications are listed for various models.

Featured is a table listing 43 options, attachments, and accessories available for lift trucks, showing what is obtainable for each model. Specialized handling attachments are given to outfit a truck for a specific handling job. SOURCE: **Hyster Co., Dept. OGJ, P.O. Box 847, Danville, Ill.**

Wellhead-equipment reference guide

. . . and an added publication on multistring wellhead equipment can be obtained. Wellhead assemblies for the completion of wells and for servicing equipment in the field are described in Bulletin 510.

The 28-page literature also gives specifications for many types and sizes of components, and includes instructions for flanging up a new triple-sealed wellhead unit.

Sixteen-page Bulletin 506 covers seven types of dual and triple-string equipment rated for maximum working pressures of 3,000, 5,000, and 10,000 psi. SOURCE: **National Supply Co., Dept. OGJ, Two Gateway Center, Pittsburgh 22.**

New natural-gas engine

. . . known as Model GAC-2 is detailed in a new brochure which gives operational information, field-test data, prices, and specifications. Developed for economical use where natural gas is available for fuel, the new engine is adaptable to a wide variety of applications including: prime power for pumps, compressors, and generators; liquid transfer; and shallow-well pumping. SOURCE: **American Marc, Inc., Dept. OGJ, 1601 West Florence Avenue, Inglewood, Calif.**

tames "WILD ENGINES" . . . . . in a hurry!

Even the finest engines, attended or not, can go "wild" and suffer serious damage caused by overheated cooling water or lubrication oil pressure failure. Penn Safety Controls eliminate these two dangers *automatically* by warning you *before* serious damage can be done. Learn more about how Penn Controls can save you time and money, write...

PENN CONTROLS, INC. Goshen, Indiana
EXPORT DIVISION: 27 E. 38th ST., NEW YORK, N.Y.

AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

NOW! DRY FRAC* IN

These BS&B Short-Cycle Hydrocarbon Recovery Units Offer Operators Maximum Economic Advantages In The Processing Of Lean Gas Streams At Moderate Pressures

BS&B DRY FRAC UNITS, now available in 2, 3 or 4 tower systems with either open cycle or closed cycle regeneration, extend the principle of *adsorption* to hydrocarbon recovery where natural gas streams of moderate pressures are too lean to be processed economically by other means. In addition to obtaining hydrocarbon dew point control through the recovery of a significantly higher percentage of available pentanes from wellstreams of low C_5^+ GPM, these DRY FRAC units also accomplish dehydration of sales gas to pipeline specifications. Recovered hydrocarbon liquids will usually pay for the entire cost of the unit within a relatively short time, after which they will add substantially to over-all profits.

Eight Advantages of DRY FRAC

1. **DRY FRAC** is *dependable*—makes operation practical on an unattended basis using "pumper" labor.
2. **DRY FRAC** is *compact*—features skid mounting and prefabricated piping to simplify field installation.
3. **DRY FRAC** is *completely automatic*—controlling instruments are mounted in a compact panel for convenience. Motorized diaphragm valves result in positive shut-off and easier maintenance.
4. **DRY FRAC** is *familiar*—mechanical components are familiar to "pumper" labor. Basic process is familiar to anyone with standard dry desiccant dehydrator experience.
5. **DRY FRAC** is *safe*—process heat is supplied by an indirect heater for maximum safety.
6. **DRY FRAC** is *versatile*—can be designed for use with either electric or gas engine drive on the blower when closed cycle regeneration is selected. Can be designed for use without power by using open cycle regeneration or gas expansion drive of regeneration gas blower.
7. **DRY FRAC** has *unique cooling*—employs unique system for maintaining cool temperature on outside shell of sorbers—eliminates much lag between heating and cooling, thereby reducing heating and cooling gas requirements and fuel consumption.
8. **DRY FRAC** can be *waterless*—system can usually be designed to operate without the need for water.

Optional Accessories:

1. Stage separation equipment can be added to DRY FRAC in order to get regeneration gas separator liquid into the stock tank.
2. For controlled vapor pressure and maximum liquid retention in the stock tank, stabilization may be added to handle the DRY FRAC liquid.
3. The closed cycle regeneration system can be used on any of the DRY FRAC systems when a minimum pressure drop through the DRY FRAC is desired. On 2 tower systems, the closed cycle system enhances recovery.
4. For a minimum of investment and operating costs the open cycle regeneration system may be selected for any DRY FRAC system.
5. DRY FRAC can be designed for water or air cooling.
6. When closed cycle regeneration is selected, the blower may be powered by electricity, gas engine or main gas, as the customer prefers.
7. When closed cycle regeneration is selected, open cycle regeneration may be added to the system for standby service with the addition of other control equipment. The system may be controlled to switch to open cycle operation automatically in the event the blower stops.
8. All control systems include a safety feature to prevent switching into a bed not sufficiently cooled, which would cause excessively hot gas to enter the pipeline.

*DRY FRAC is a trade name of Black, Sivalls & Bryson, Inc.

EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

If you'd like more detailed information on DRY FRAC, ask your nearby BS&B Man, or write in directly to...

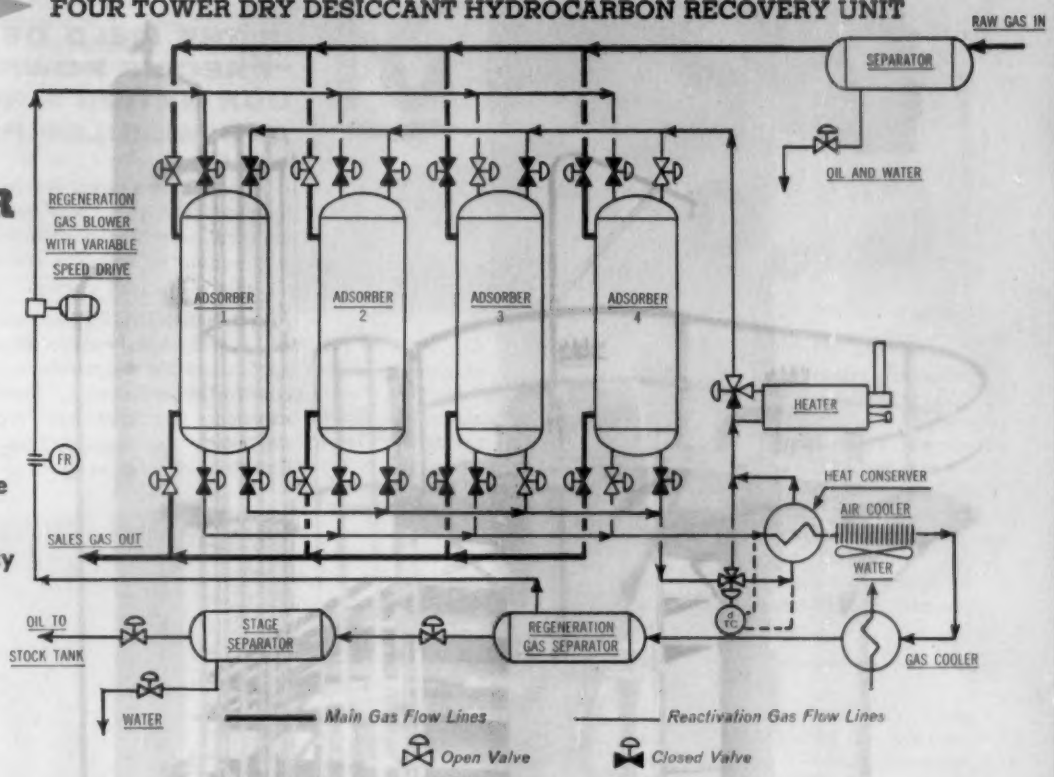
BLACK, SIVALLS &

2, 3 or 4 TOWER UNITS!

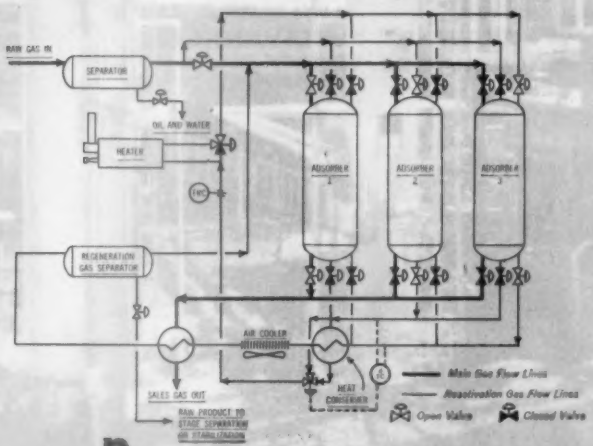
FOUR TOWER DRY DESICCANT HYDROCARBON RECOVERY UNIT

4 TOWER

For handling extremely large through-puts of natural gas at minimum operating cost. Has low pressure drop, high recovery efficiency



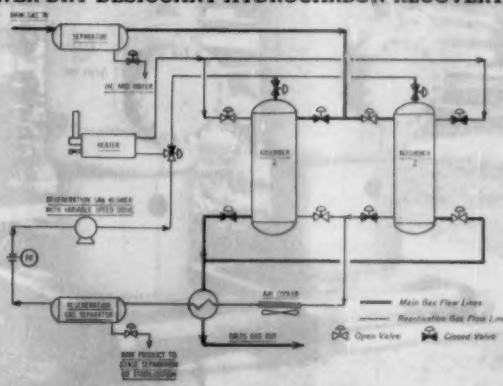
THREE TOWER DRY DESICCANT HYDROCARBON RECOVERY UNIT



3 TOWER

For efficient processing of volumes ranging from 10 to 50 MMSCFD.

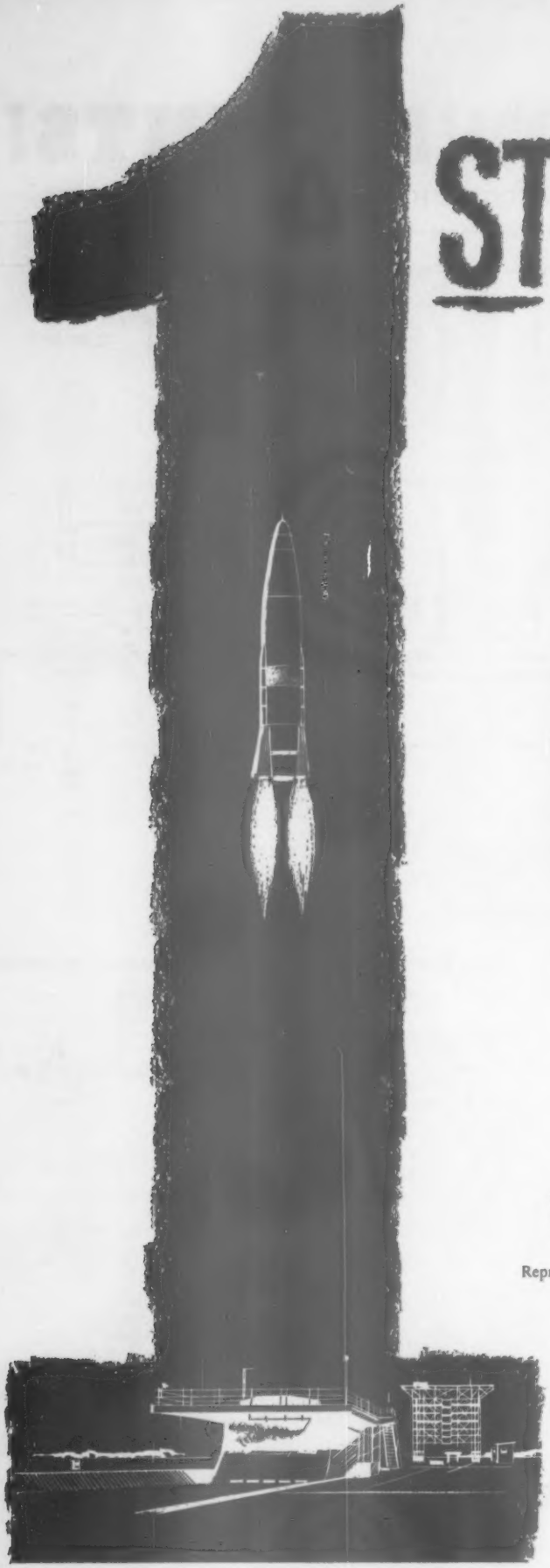
TWO TOWER DRY DESICCANT HYDROCARBON RECOVERY UNIT



2 TOWER

Designed for handling 10 MMSCFD or less.

BRYSON, INC. DEPT. 1-A9A P. O. BOX 1714, OKLAHOMA CITY



1ST

IN THE FIELD OF "PRECISE POWER" FOR OUR NATION'S ROCKETS AND MISSILES PROGRAM

When you have a power problem . . . and want it solved quickly . . . why not draw *first* on the tried and proved experience of Stewart & Stevenson Services . . . the world's largest distributor of diesel engines.

In our Nation's rockets and missile programs . . . as well as in thousands of commercial applications for the petroleum, industrial and construction industries . . . Stewart & Stevenson experience and "know-how" is paying off in dependable day-in-and-day-out performance. Call, wire or write today.

STEWART & STEVENSON SERVICES, INC.

STEWART & STEVENSON

Main Office and Plant:	4516 Harrisburg Blvd., Houston 11, Texas Phone CApitol 5-5341
Branches:	Corpus Christi, Dallas, Lubbock, San Juan, San Antonio, Beaumont, Odessa
Representatives:	Longview, Brownsville, Wichita Falls, Freeport
Export:	Room 1405, 74 Trinity Place, New York, N. Y.

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

Longhorn Supply opens office

. . . in Dallas and appoints Charles R. Williams sales representative there to cover the Fort Worth-Dallas, Oklahoma City, and Tulsa areas.

Williams joined Black, Sivalls and Bryson in 1940 and, after World War II, was employed by Dowell as a sales engineer. In 1946 he started with Union Tank Co., and was a sales representative in Alice, Tex., before opening a Dallas office in 1949.

In 1953, Williams was promoted to regional sales manager and became sales manager in the Houston headquarters 2-years later. He was Union's Gulf Coast regional sales manager when he left to join Longhorn Supply Co.

Robert V. Peaslee elected v.p.

. . . of Ralph M. Parsons Co., engineers - constructors of Los Angeles, announces Ralph M. Parsons, company president. Peaslee, former vice president of C. F. Braun & Co., will locate at Parsons' New York office.

R. A. Gentry becomes a partner

. . . in H. P. Gott Mfg. Co., of Winfield, Kans. Gott manufactures oilfield water cans and coolers. Gentry was employed by Continental-Emsco for 23 years, and most recently was the Houston firm's division manager.

BJ Service moves into Bolivia and sets up a field station

. . . in Yacuiba, reports John B. Merritt, president and general manager of the oil-well service firm. The first contingent of well service tools and equipment was shipped from Houston to Buenos Aires by ocean freighter, and then trans-shipped by rail across the Andes mountains to Yacuiba.

Included in the shipment was the BJ Admiral (shown above), a high-pressure cementing, fracturing, and pumping unit. It's especially suitable for Bolivia's high-pressure gas wells, which often reach a depth of 12,000 to 14,000 feet.

Well-service operations are now under way at the Yacuiba station—located just north of the Argentine border—under terms of a contract with Bolivian Oil Co. and its operator, Big Chief Drilling, Oklahoma City. Station services are also available to other oil-well operators in Bolivia and northern Argentina.

Texas Instruments, Inc. names

. . . Ray H. Fara eastern region sales manager for the instrumentation product group of the firm's GeoSciences & Instrumentation Division. O. F. Henning, industrial products sales manager, made the announcement.

Since joining TI 2-years ago, Fara has served as a district sales manager. He will continue to make his headquarters at Garden City, Long Island. Prior to joining the Houston-based firm, Fara was with Newmann Industries as a district sales manager.

Charles Kuhn made vice prexy

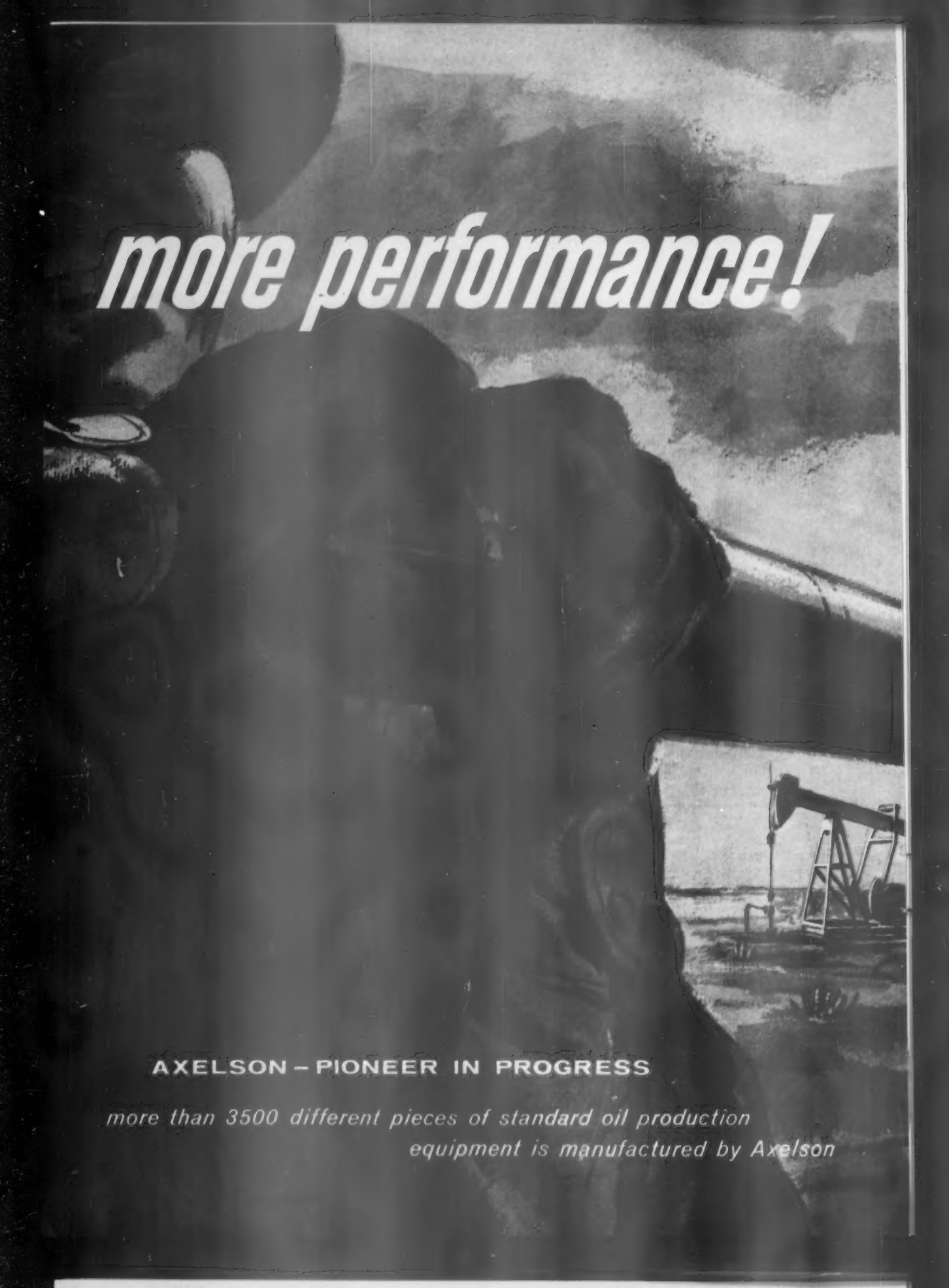
. . . and sales manager of Dresser Mfg. Division, Dresser Industries, Inc. Kuhn began his business career with Fansteel Metallurgical Corp., and in 1952 became vice president and general sales manager. He then joined Hills-McCanna in 1955 as general sales manager.

Kuhn started with Dresser Mfg. Division as sales manager in February 1958. In addition to directing an expanded sales effort, he has concentrated on marketing 15 new products during the past 18 months.

INTERNATIONAL GUESTS at a recent meeting of the Los Angeles Chapter of Nomads are, from left, standing: Ivan Duranthon, Camdrill, France; W. N. Tommy Thompson, Cities Service, Colombia; John F. Drake, Amoseas, Libya; Orville Stanford, Camdrill, Libya; Richard C. Woods, Mene Grande, Venezuela; Yves Bricaud, CFPA, Algeria; and Jose Owens, Empresa Nat. de Petroleo, Chile. Seated, from left, are B. R. Hawkins, Camdrill, Turkey; J. C. Bazinet, Petrobras, Brazil; H. J. (Cy) Perkins, Rocketdyne Division, American Aviation, speaker; Al Dysart, International Brown, Turkey; and Barney Horan, Camdrill, Libya.

Cummins Engine Co. promotes

. . . R. S. Bowie to sales manager, oil and gas industry. He will be located at the Cummins factory in Columbus, Ind. Bowie will direct a staff of Cummins specialists providing the oil and gas industry with diesel sales and service. He heads up industry spe-


more performance!
AXELSON – PIONEER IN PROGRESS
more than 3500 different pieces of standard oil production
equipment is manufactured by Axelson

3 "STANDARDS" PERFORM MORE

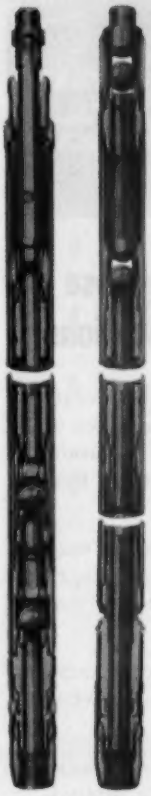
AXELSON SURE-SEAL

The Axelson "Sure Seal" RWA, RWB, and RWT are the most widely accepted pumps in the Axelson line. This popularity is contributed in part to these features: Economy; complete interchangeability of parts; long dependable service; and the variety of plunger and tube combinations available.

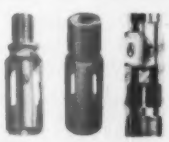
RWB – This "Sure Seal" (Bottom Hold Down) pump with stationary barrel is available with either 3-cup Hold Down Body Assembly (for seating nipple) or API Bottom Lock Mechanical Hold-Down (for mating shoe in tubing string).

RWA – This "Sure Seal" (Top Hold Down) pump with stationary barrel is preferred where sand and gas are present. Available with Top Hold-Down or Axelson Mechanical Top Lock Assembly, the pump provides improved gas separation and free entry of fluid into the producing chambers.

RWT – This "Sure Seal" traveling-barrel type pump is available for operators who prefer the traveling-type pumps for their particular well condition.



RWB RWT



REPLACE WITH AXELSON

Axelson offers open and closed cages for all types of pumps as both working and standing valves. All are of rugged construction and machined from high-quality alloy steel to provide maxim um strength and wear resistance.

Write for 1959 Axelson catalog

USI Axelson

DIVISION OF U. S. INDUSTRIES, INC.

6160 S. BOYLE AVENUE • LOS ANGELES 58, CALIF. • LUdlow 7-1271

Copyright 1959 – Axelson – Division of U.S. Industries, Inc. – AX-16-59

How Quaker Thermoid made ground-refueling hose to meet toughest government specifications

1. Developed a tube compound that can carry all aircraft fuels without showing appreciable signs of swelling or loss of adhesion to the carcass. A tube that withstands constant bending, twisting, and flexing without ply separation. Performs well in the range −40°F to +130°F.

2. Developed a tube reinforcement that is lightweight for easy handling and storage, yet able to withstand extremely high pressure without bursting. Resists weather, mildew, rot, and oil.

3. Developed an abrasion- and oil-resistant cover compound that protects the tube and reinforcement from damage when the hose is dragged over concrete aprons.

4. Completely bonded all component parts by an exclusive process of curing and manufacturing to provide a ground-refueling hose that is not only strong and easy to handle, but the safest ever built.

Get complete information on Thermoid-Quaker ground-refueling hose from your local Thermoid industrial distributor, or write *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

THERMOID PORTER DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

HYCALOG DIAMOND CORE BITS

HYCALOG

WIRE LINE CORING RECOVERS MORE CORE... FASTER IN GULF AREA

High penetration rates were maintained on these seven wells... *with Hycalog diamond wire line coring bits*... and drill strings didn't have to be pulled for bit changes until coring was completed. Located in Webb, Matagorda, and Orange Counties, Texas, and St. Charles Parish, Louisiana, they are typical of coring jobs throughout the Gulf area.

SIZE BIT	NO. CORES CUT	FEET CUT	% RECOVERY	AVERAGE FT./HR.
7⅝ x 1¾	10	129	100.	7.15
7⅝ x 1¾	12	130	97.	8.25
6¾ x 1¾	5	62	99.9	4.65
7⅝ x 1¾	17	155	80.	5.24
7⅝ x 1¾	37	465	95.5	4.2
7⅝ x 1¾	32	463	87.	6.9

Why not let Hycalog diamond core bits set a record on your next coring program? *And ask us about Hycalog* GAS CHRONO-FRAC *well logging services.*

Hycalog, Inc.

505 AERO DRIVE
SHREVEPORT, LOUISIANA

BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND BITS DIAMOND CORING
WELL LOGGING CORE ANALYSIS

cialists located in the Southwest, New York, California, and overseas.

Bowie has 24-years experience in dealing in the oil and gas industry. He was with Cooper-Bessemer Corp. before joining Cummins 4-years ago.

Two division managers named

... by Welex, Inc., Fort Worth wire line service company.

J. J. Blaydes takes over the Texas Gulf Coast division with headquarters in Houston. W. L. Laflin now has charge of the Louisiana Gulf Coast division. Both men formerly were assistant division managers.

J. J. Blaydes

W. C. Laflin

Blaydes, a veteran of 19 years in oil-well servicing, has been with Welex since 1952. He was a sales engineer with the company prior to his promotion to assistant division manager at Houston 5-years ago. Laflin has 11 years of wire line service experience.

Western Co. celebrates birthday

... which marks 20 years of operation in the southwestern oil fields. A party was held at Seagraves, Tex., recently, the original location of the company when it acidized its first well.

The event also served as open house for the company's new district facilities at Seagraves. On hand to greet guests were H. E. (Eddie) Chiles, president; Walter Beadle, executive vice president; Charles Simmons, Midland division manager; and other officials and managers of Western.

Western officials cited highlights of the company history from its origin to the present day. Chiles, who along with Robert L. Wood founded Western, has been the firm's president since its beginning.

Lane-Wells Co. opens station

... in Atwood, Kans., to offer the company's newest developments in perforating, nuclear logging, Vibro-Frac, packers, and bridging plugs.

Charles Farr, formerly with the company at Stockton, Kans., will be operating engineer in charge of the new technical oil-field location. Farr has more than 8-years' experience as an operator and supervisor of oil-field

OUTSELLS THEM ALL!

HERE'S WHY

1 2½ to 1 ratio – guide length to guide diameter–prevents galling and hanging up.

2 High thermal expansion rate of sleeve guide and low thermal expansion rate of hardened stem retainer eliminates binding and galling even at elevated temperatures.

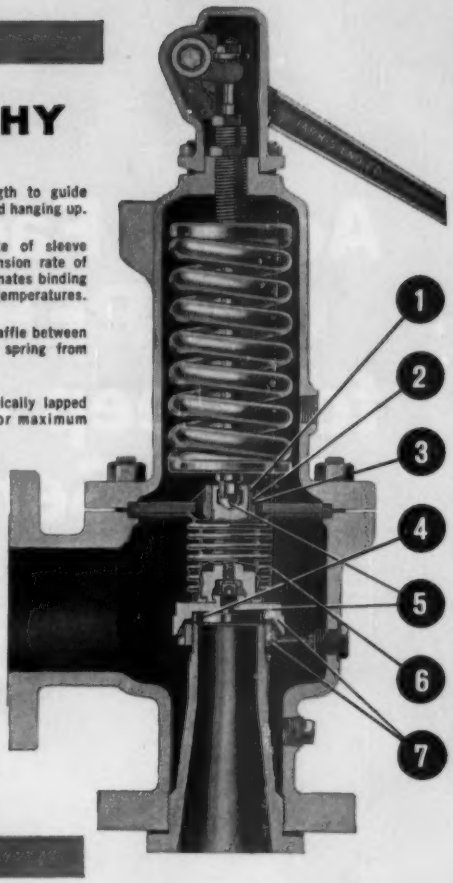
3 Sleeve guide provides solid baffle between body and bonnet, shielding spring from lading fluid.

4 Hardened stainless steel optically lapped flat disc – self aligning for maximum tightness.

5 Double universal ball joint from stem to disc for self alignment – eliminates effects of spring, temperature and piping distortion.

6 Stainless steel "BALANSEAL" bellows nullifies effect of back pressure and isolates internal working parts from lading fluid.

7 Cone-shaped disc holder directs flow away from guiding surfaces and forms fixed secondary orifice with single blowdown ring control for built-in capacity.



Farris full nozzle Safety-Relief Valves

Simplicity in design, safety in operation ... what more can you ask of a Safety-Relief Valve! The patented design features shown in this Farris valve have been *standard* for more than a decade. It's the ideal concept of a trouble-free, safe, safety valve, free from inventory and design change problems since 1945. It's the *preferred design* in full nozzle safety-relief valves for the process industry.

Detailed information for the selection and sizing of all Farris process safety-relief valves is in Catalog FE-118. Sent to you on request.

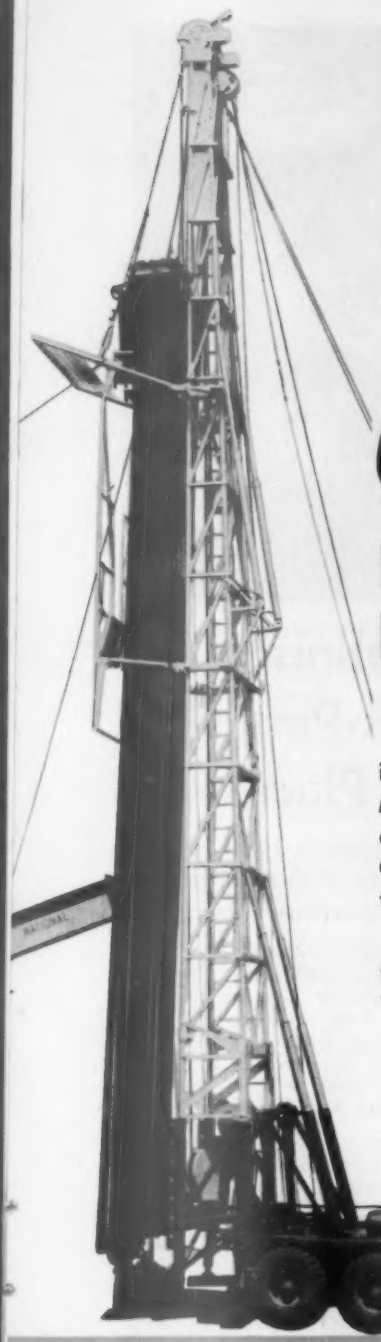
Farris ENGINEERING CORP.
527 Commercial Avenue, Palisades Park, N.J.
Texas Plant: 5405 Clinton Drive, Houston 20

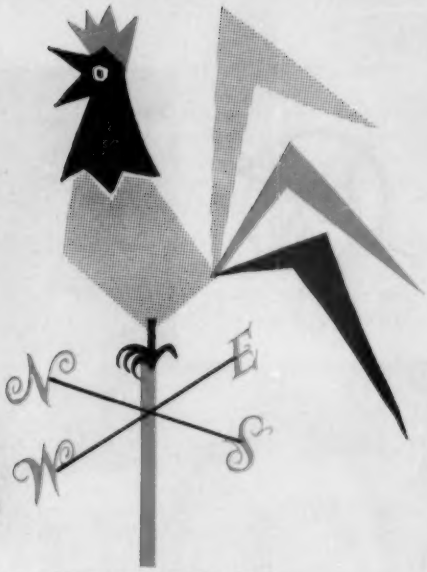
affiliates: FARRIS FLEXIBLE VALVE CORP. • FARRIS PICKERING GOVERNOR CO., INC. • FARRIS ENGINEERING LTD., LONDON, ENGLAND

Actual Facts About COOPER Portable Rigs for Deep or Shallow Well Servicing

- Fast "Pay-Out" For Contractors
- Low First Cost
- Low Maintenance Cost
- Built For Your Exact Needs
- Fits Contractors Requirements
- 41 Years of Experience Built into Every Cooper Rig
- In Use Around the World
- Built for Years of Future Service
- Parts Always Available . . . Even for Early Models of Cooper Rigs

See The Following Pages





Cooper
DOUBLES RIGS
HAVE ARRIVED

In only a few months Cooper Skytop Rigs have gone to work in Louisiana, East Texas, West Texas, Gulf Coast, Texas Panhandle, Mississippi, Montana, North Dakota, Wyoming, Oklahoma, Canada, and Mexico. But that's not all, many more are on the way because Cooper Skytops are setting new standards for oil well servicing. If they are not now working near you they will be soon.

Watch for them and see them work. Then you will know why the rigs are called the hottest unit to hit the oil fields since Cooper Winch Tractors changed well servicing ideas in 1918.

USERS SAY THEY LIKE . . .

"Racking pipe in doubles."
"Derrick hydraulic system for power subs, tongs and other power tools."
"No more load guylines to the ground."
"They handle any load so easy."
"Have real field portability."
"Time saved doing the job."
"Fast, easy rig up and rig down."
"Highway travel without special permits."

SEE A COOPER REPRESENTATIVE OR WRITE, WIRE OR CALL . . .

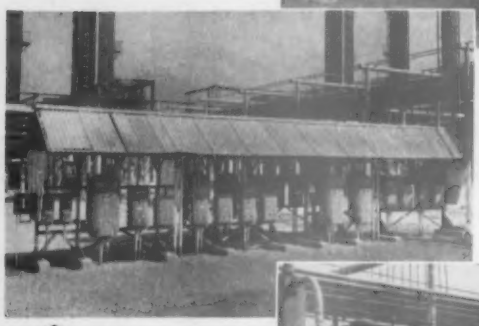
FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Olney

Right foreground: Nelson Class 1041, oil-immersed, 4160 volt motor starters

Left background: Nelson Class 497, factory-assembled switchrack, 480 volt



Nelson Class 497 switchrack with explosion-proof starters

Nelson 2000 KVA, double front, unit substation (explosion-proof)

Phillips Chemical Doubles Plant Capacity

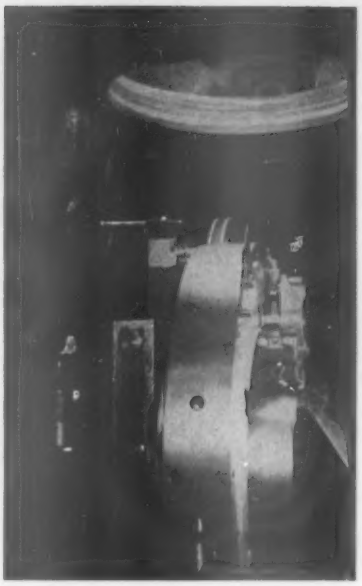
Editors of a leading magazine recently published a six page article on how Phillips Chemical doubled the production capacity of its Plains Synthetic Rubber Plant. They told how it was done and stressed the importance of selecting quality equipment to assure a high degree of reliability. In addition to the equipment pictured Nelson furnished such vital equipment as motor control centers, explosion-proof circuit breakers, combination starters, control stations and lighting panels.

Nelson takes pride in building quality into every job. If you are looking for a source of electrical control equipment that puts pride of workmanship above all, may we suggest you contact your Nelson Sales Representative. Offices are located in principal cities throughout the United States.

P. S. If you would like a print of the article mentioned please send your request to the factory. It will be mailed promptly.

At Nelson . . . . *quality* comes first!

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA



. . . Refinish Crank-Pins . . . In Place!

● Accurate High Quality Maintenance And Machine Work

The small engine crank pictured above was restored in close quarters without dismantling engine. Our portable machines can solve your problems and save you money. Crank pins from 5½" through 20" in diameter accurately refinished in place at great saving in cost. **Let us help you minimize down time.**

Worn and damaged flywheel fits refinished in place.

In our shop crankshafts of any size or type completely refinished. Shafts straightened and broken shafts successfully repaired.

Most modern methods used in rebabbitting and machining engine and turbine bearings.

All types of heavy power plant equipment serviced with special attention given to emergency repairs.

Additional information furnished without obligation.

WASHINGTON
IRON WORKS, INC.
SHERMAN, TEXAS
Established 1876
Phe. TW—2-8145

services. The announcement comes from Charles O. Ohl, district manager of Lane-Wells' Great Bend, Kans. district.

Jerry F. Boutwell is appointed

J. F. Boutwell

. . . sales manager of the oil-well pump section of Byron Jackson Tools, Inc., according to J. T. Carle, section manager. Boutwell, who has 12-years' experience in submersible-pump sales, will headquarter in Byron Jackson's Tulsa plant.

Granberg Corp. announces

. . . the appointment of Murphey-Hessin Co., San Francisco, as sales representative in Northern California, including the San Francisco Bay area. The announcement comes from Robert C. Anderson, Granberg's vice president and general manager.

The newly formed Murphey-Hessin Co. is a petroleum-equipment sales and engineering organization headed by Randy Murphey and Bill Hessin. Granberg products include pumps, meters, valves, and accessories.

Oil Base appoints Peute-Chemie

. . . of Hamburg, Germany, exclusive sales agents for Black Magic and mud additives for Germany and Austria. The German firm has also been licensed to manufacture White Magic emulsifying agent, Formaseal lost-circulation material, and No-Glo non-fluorescing mixing oil. Oil Base, Inc. headquarters at Compton, Calif.

WAREHOUSE-OFFICE building has been erected by Alco Products Oil Field Equipment Co., Inc., in Houma, La., to serve onshore and offshore areas of Louisiana. Of the 3,200 sq. ft. in the building, about 2,500 sq. ft. are devoted to warehouse area. Included in the facility are steam-cleaning equipment and two test racks with test capacity of 30,000 psi.

Dresser to move Turbodrill

. . . Division from its present location on the grounds of Guiberson Corp., another Dresser industry, according to J. B. O'Connor, Dresser president.

According to O'Connor, the company feels that the turbine has been improved and perfected to the point that it leaves little to be desired. O'Connor further pointed out that the principal difficulty now lies in developing a bit which can withstand the great speeds attained by the turbodrill.

To this end, personnel and facilities of Turbodrill Division are moving to the Dallas plant of Dresser's Security Engineering Division. There, turbodrill engineers will have the advantage of large metallurgical labs, heat-treating facilities, and testing devices that should aid in the creation of a satisfactory turbo-bit.

Mid-Continent Supply Co. adds

. . . three Delta Tank specialists to the company's West Texas and New Mexico division.

George W. Williams joins the firm in Midland, Tex. He is regional sales engineer for Delta equipment in the

BALANCE with JENSEN!

It's a simple one-man job to balance a well with a JENSEN Rotary Balanced JACK. Moreover, you're more likely to *keep* a well in balance the easy, accurate JENSEN way. Equipment above and below ground lasts longer and runs better on JENSEN-equipped wells.

There are 13 sizes in these famous orange and gray JENSEN JACKS—money-savers for wells to 7,500 feet.

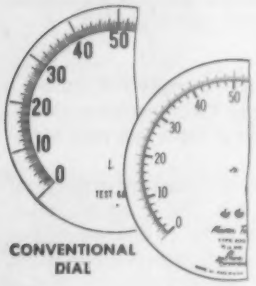
JENSEN JACKS are built *to make wells more profitable.* For your information and your files, write NOW for the whole story.

STOCKED BY YOUR LOCAL SUPPLY STORE

Made by JENSEN BROS. MFG. CO., INC., P. O. Box 477-F, Coffeyville, Kansas
Export Office: 250 Park Avenue, New York 17, N. Y., U. S. A.

JENSEN JACKS

Presenting New MARSH "*Master-Test*" SERIES
of extremely accurate test gauges

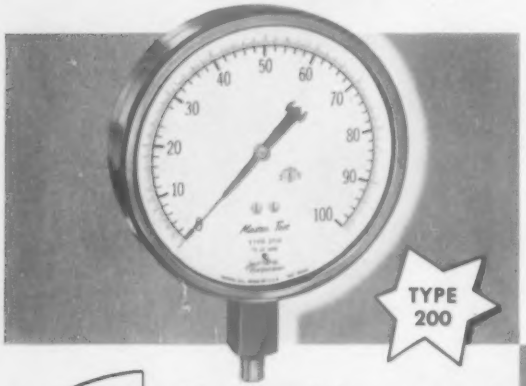


Crowning achievement in instrument making... this superb series of test gauges developed to meet today's exacting requirements of instrument men throughout industry. Accuracy and dependability beyond compare...each gauge individually dead-weight tested (think what that means!)...each gauge guaranteed accurate within ¼ of 1% plus or minus of the maximum dial reading over the entire range.

To provide reading accuracy in keeping with the accuracy of the instrument, all "Master-test" gauges have the simplified "Read-easy" dial (patent pending) illustrated opposite—a dial that can be read with the accuracy of a caliper, yet with the ease of a clock.

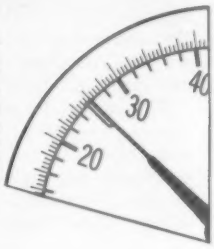
To further increase accuracy, three advanced means of reading have been developed as described below: the "twin-tip" pointer; the mirror path; the non-parallax dial.

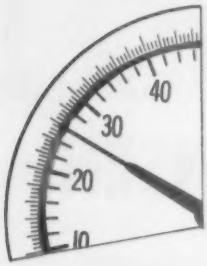
"Master-test" gauges are available in sizes 4½", 6", 8"...in all standard ranges from 0-15 to 0-30,000 psi...in vacuum and compound types...in a full range of case patterns. Ask for 20 page bulletin.



← with "Twin-tip" pointer

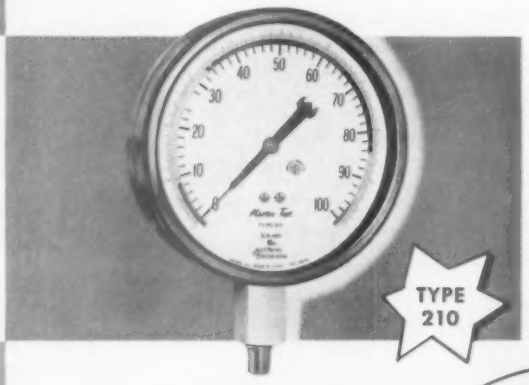
The most common error in reading pressure occurs when the observer reads from an angle rather than "dead on". This Marsh "Twin-tip" pointer enables the operator to know when he is dead on by lining up the two tips so that only one is visible. The twin-point arrangement is similar to the sights on a rifle.

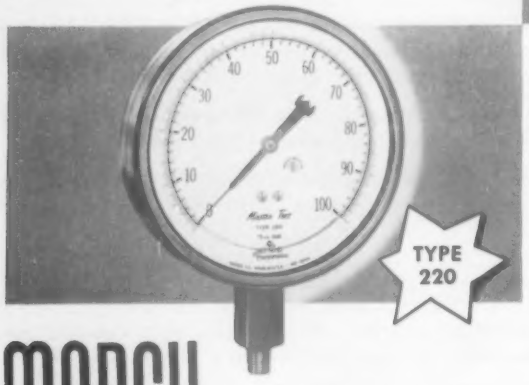




with mirror dial →

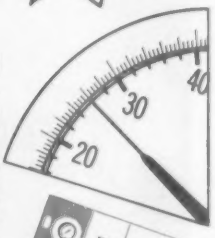
Another method of insuring accurate "dead on" reading. Knife edge pointer is reflected by the mirror path. When reflection is not seen, reading is dead on and true. The ease and accuracy with which the mirror dial may be read cannot be duplicated by any other mirror type dial. It is the combining of the mirror path with the exclusive Marsh "Read-easy" dial that makes this faster, error-free reading possible.



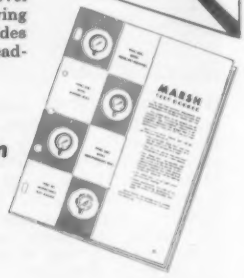


← with "Non-parallax" dial

This Marsh development eliminates mistakes in dial reading even if read at an angle. To accomplish it Marsh engineers designed a clear Plexiglas insert placed, as shown, over the fine graduations so that they appear to be at the same level as the pointer regardless of the viewing angle. The "Non-parallax" dial provides the easiest and most accurate dial reading available.



Ask for this 20 Page Bulletin



MARSH

THE STANDARD OF ACCURACY

MARSH INSTRUMENT COMPANY, Dept L, Skokie, Ill.

Division of Colorado Oil and Gas Corporation • **Marsh Instrument & Valve Co., (Canada) Ltd. 8307 103rd St., Edmonton, Alberta, Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas**

West Texas and New Mexico division and also in the Rocky Mountain division.

Also joining Mid-Continent is James A. Kepley. He assumes the task of division sales engineer.

Harry M. Lowe takes over

. . . as Sperry-Sun Well Surveying Co.'s new western division manager. The division is comprised of three California offices—Long Beach, Ventura, and Bakersfield — and two Rocky Mountain offices — Casper, Wyo. and Durango, Colo.

Lowe, a 15-year company veteran, will continue to maintain his office in Long Beach where he has been for the last 11 years, supervising the activities of Sperry-Sun's California operations.

TUNISIA BOUND are five trailer truck loads of pipeline construction equipment fabricated by M. J. Crose Mfg. Co., Tulsa. This $250,000 worth of equipment will speed construction of a 24-in., 476-mile crude pipeline to run from Cekhira, Tunisia, to Edjeleh, Algiers. Crose personnel shown are, from left: Loyd Partney, assistant shop superintendent; Bill Handwerk, chief engineer; John Brand, vice president; and John Manley, export sales manager.

A. H. LeBleu is named director

. . . of sales training for Hughes Tool Co., according to M. E. Montrose, vice president, sales. LeBleu, who joined Hughes in 1937, has been regional special representative in Houston since 1955. He will continue to headquarter in Houston.

LeBleu joined Texaco at Houma, La. in 1930, working first as a roughneck then as a driller on rigs engaged in water operations along the coast of Southeast Louisiana.

Rhein Benninghoven is named

. . . sales representative for the Kansas-Missouri-Nebraska area of Edward Valves, Inc., East Chicago, Ind. manufacturers of cast and forged-steel valves. Benninghoven, district sales manager for Republic Flow Meters Co. of Chicago the past 28 years, will also continue in that capacity. His offices are in Kansas City, Mo.

The announcement comes from W. F. Crawford, president of Edward Valves and Republic Flow Meters, both subsidiaries of Rockwell Mfg. Co., Pittsburgh. Benninghoven joined Republic in 1929 as a service engineer and was assigned to Kansas City the following year. He recently completed a training course in steel valves at the Edward research laboratories and factory in East Chicago.

DIRECT PIPELINE TO THE WORLD'S OIL CENTERS

CARGO OR PASSENGER, IT'S KLM "THE OILMAN'S AIRLINE!"

FROM HOUSTON: direct to Europe, Africa, the Near, Middle and Far East. FROM MIAMI: direct to South America. Daily service. FROM MONTREAL: direct to Europe, Africa, the Near, Middle and Far East. FROM NEW YORK: direct to all Europe and beyond; also to Curacao, Aruba and South America. IMPORTANT: Your cargo receives rapid ground handling. Awkward shapes easily accommodated. FOR PASSENGER SERVICE: Call your Travel Agent or KLM office. For cargo service: Contact your Cargo Agent, Forwarder or KLM office.

KLM ROYAL DUTCH AIRLINES • 609 FIFTH AVENUE • NEW YORK 17, N. Y.

DEMCO
"MUD KING"

The Industry's Finest Valve

For mud lines, sand-frac, cementing and other water, oil or gas services.

Sizes: 2, 3, 4 inches
2,000 lbs. W.P. (4,000 lbs. test)
3,000 lbs. W.P. (6,000 lbs. test)

AT SUPPLY STORES EVERYWHERE

DRILLING EQUIPMENT MANUFACTURING CO.
DEMCO
Oklahoma City, Oklahoma

THE HOTEL

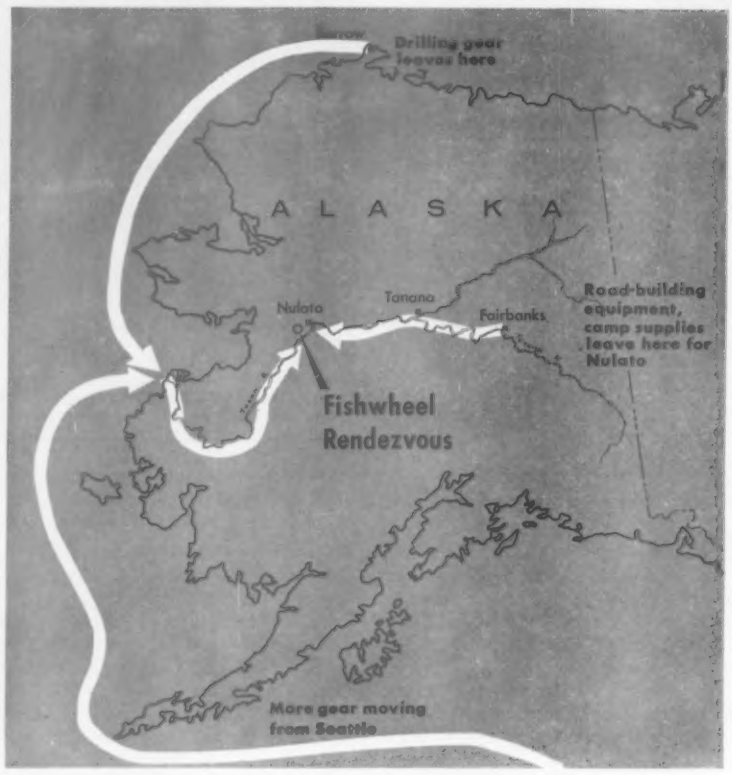
in the Oil Capital of the World

100%
Airconditioned
600 Bright *Reasonably* Priced Rooms

THE MAYO

TULSA'S *Finest* HOTEL

Sample Rooms - Finest Food
Adjacent Garage



Interior Alaska's first wildcat this fall took careful coordination. Here's the story of . . .

Operation Cooperation

MORE than 4,000 tons of oil drilling and construction equipment will be put ashore near Nulato before freeze-up in an effort to have interior Alaska's first wildcat well sunk this fall.

Three earth-moving tractors and other road-building equipment left Fairbanks by river barge late in August. Camp equipment and supplies were also loaded onto barges there. The barges follow the Chena River into the Tanana past Nenana to Tanana where the Tanana River meets the Yukon River. From this point they will proceed to a fishwheel rendezvous 7 miles downstream from the town of Nulato.

At Barrow on the Arctic Ocean, the first barge of drill-rig parts and oil-field supplies was loaded and left August 20. The second barge, with the balance of the drilling gear left Barrow August 25. Marvin Moncur, Mountain States Drilling Co., and Jack Rives, Colorado Oil & Gas Co., who have been in Barrow for several weeks to supervise loading of the barges, are on their way back to Denver.

More barges with oil-field equipment and supplies for the first Nulato Unit well will soon leave Seattle. The flotilla of barges plan to meet at the mouth of the Yukon River.

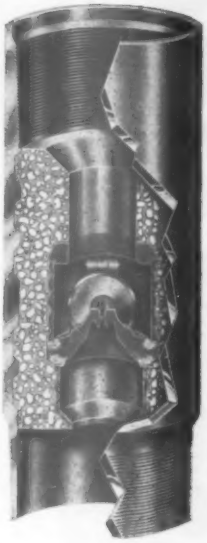
Coordinating shipment of supplies from Fairbanks is Exploration Services, under the direction of Ted Mathews. All of the barges will unload 7 miles below Nulato. Work will begin immediately on a 14-mile road extending west into the probable drilling area. From 15-20 men will be employed by Exploration Services to build the road and set up camp. Mountain States Drilling Co. will send in a crew of about 30 men for the drilling operation itself. Spudding date is tentatively set for October.

Movement of the first load of heavy equipment from Fairbanks to Nulato is under the supervision of Art Peterson of Yutana Barge & Freight Lines. This fleet will stop at Nenana and load on more tanks and fuel for the

THE PERFECT COMBINATION

For Protecting Low Pressure Producing Zones

A LARKIN FILRITE FLOAT COLLAR
A LARKIN CEMENTROL GUIDE SHOE



Filrite Float Collar
Fig. 451

FILRITE EQUIPMENT was designed to allow automatic filling of the casing while it is being run and to eliminate pressure surges which might break down weaker formations.

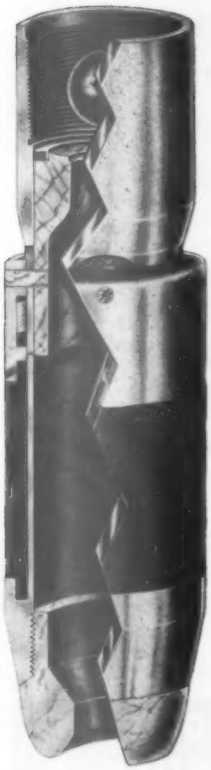
CEMENTROL EQUIPMENT was originated by Larkin for the purpose of protecting exposed producing formations against contamination by cement. Cementrol effectiveness has been proved in thousands upon thousands of wells over a period of fifteen years.

In combination, Filrite and Cementrol Equipment will provide maximum protection when casing is cemented above a producing zone.

Filrite Equipment contains a resilient diaphragm valve which prevents entrance of well fluid into the casing until several joints have been run. When fluid pressure from below overcomes the inherent resistance of the valve to open, the valve then opens and allows partial fill of the casing without overflow. This type of fill-up is continuous until casing is landed.

The Cementrol Guide Shoe serves as a guide until casing is landed. A bridging ball is then dropped and by pump pressure from the surface the Cementrol packing element is expanded against the wall of the hole and no cement can contact the producing zone.

For additional details on Filrite and Cementrol please refer to your Larkin catalog—or call your nearby Larkin representative.



Cementrol Guide Shoe
Fig. 227

A

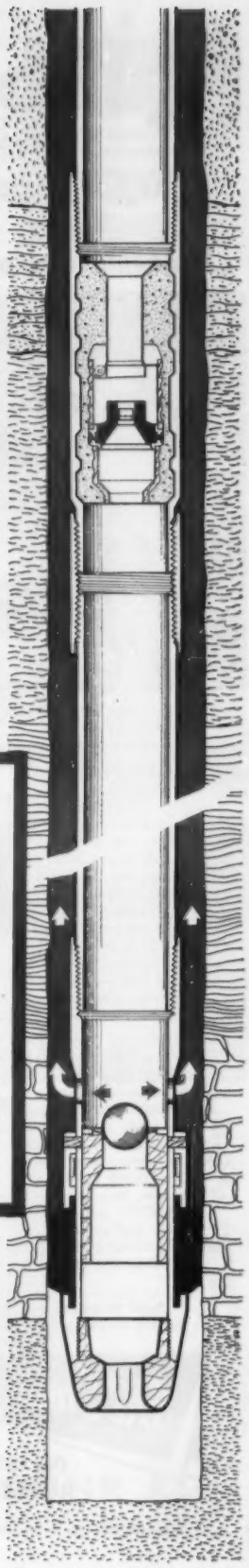
Circle A, a view 90° from that of the large illustration, shows the Filrite valve in running-in position. The resilient diaphragm valve remains closed until the differential fluid pressure across it overcomes its inherent resistance to open.

B

Circle B shows the rubber diaphragm inverted by pump pressure as the well is being cemented. Filrite is full opening and will allow passage of a bridging ball to actuate other equipment which might be installed on the casing beneath a Filrite Collar.

C

Circle C shows the spring-loaded flapper valve in closed position after being released by inversion of the diaphragm. The flapper valve in the Larkin Filrite equipment is very strong and has no depth limitations.



LARKIN
...Through Your Supply Store

LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED
BY YEARS OF DEPENDABLE PERFORMANCE

Rubber

is the Key Ingredient in any Swabbing Operation—

BUILDING "LIFE" INTO RUBBER IN THE OIL STATES MILL ROOM

. . . and fine rubber is not produced by accident. A really superior rubber product must be designed and compounded to do a particular job. Obviously, the same rubber used to make an excellent and durable truck tire, would not be suitable for use in swab cups, which are exposed to abrasive and cutting action, damaging chemicals, and high temperatures.

Only men who know rubber processing and understand the specific problems of the oil industry, can design and manufacture rubber products that *really* perform under these rigorous conditions. Such men founded and operate OIL STATES RUBBER CO. of Arlington, Texas. The name "OIL STATES" on your swab means that you are using "OIL FIELD RUBBER PRODUCTS OF MATCHLESS QUALITY."

Sold through supply stores only

Oil States

OIL STATES RUBBER CO.

P. O. Drawer 152 • Arlington, Texas

diesel tractors. Yutana Barge Lines is also handling the Barrow barge move through its Kotzebue office, under the charge of Jack Bullock.

New tubing joint for slim-hole jobs

A new tubing joint designed and marketed by Jones & Laughlin Steel Corp. is especially adaptable for slim-hole operations. It is reportedly the smallest standard outside diameter tubing having threads and couplings —2⅜-in. external upset tubing.

The coupling for this tubing is machined down to an outside diameter of 2¾ in. Formerly, API standard 3 1/16-in. threaded and coupled tubing was used.

The new-sized coupling will offer an economical solution to the problem of using several production strings in multiple-completion wells. Recommended use for this slim-hole tubing is for wells where average pressures are encountered. Joint efficiency is high when both pipe and coupling are the same grade. Added efficiency is possible when a coupling a grade higher than the pipe is used.

Offshore Ecuador test scheduled

The Pacific Ocean 5 to 10 miles off the west coast of Ecuador will be tested by Western Offshore Drilling & Exploration Co. This 3-year-old subsidiary of Haney & Williams Drilling Co., Long Beach, which was formed for offshore exploratory drilling operations, is currently assembling equipment for the drilling of exploratory holes in the offshore area of Ecuador.

The tests will be drilled for California Ecuador Petroleum Co., a subsidiary of Standard of California. The center of operations will be Guayaquil.

Equipment to be moved to Ecuador includes the "M. V. Torry," a self-propelled drilling vessel, operated off the California coast by Western Offshore Drilling & Exploration Co. for the past several years; a supply tender to be moved into the area from the Texas Gulf coast; a personnel tender to be shipped with the "M. V. Torry" from California; and a large personnel living barge to be acquired and outfitted in Guayaquil.

Jack Gregg will be manager in charge; William Yates formerly office manager for Haney & Williams Drilling Co. in Montevideo, Uruguay, is currently in Guayaquil making initial arrangements. It is expected that actual drilling will begin during the last week of September 1959.

SPECIFY 500 TON for LONGER THREAD LIFE!

Protects more tool joint threads than any other compound!

Sold ONLY through supply stores

MONEY BACK GUARANTEE

USE JIMMIE GRAY DOPE BRUSHES

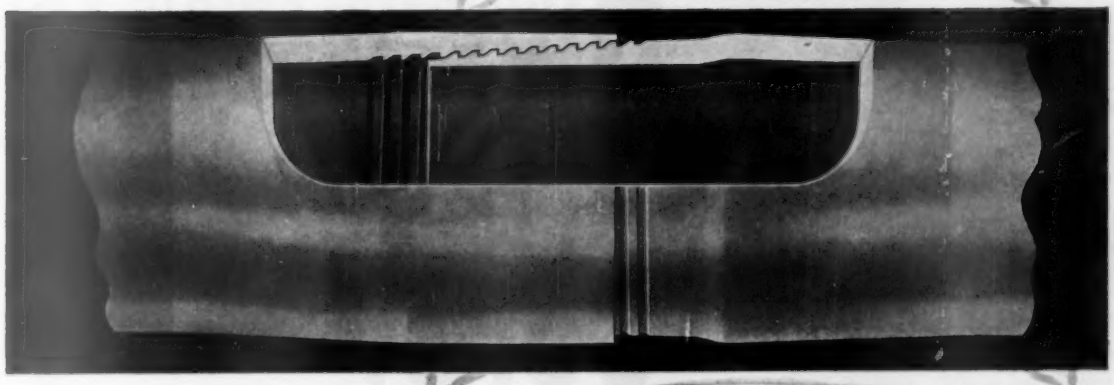
PETROLEUM DISTRIBUTING CO.

BOX 20[illegible] • HOUSTON, TEXAS • CApitol 4-964[illegible]

Omega Joints for Casing and Tubing

- Smaller borehole diameter
- Quicker assembly
- Faster casing off

Our tests have proved:
No weak spots in casing and tubing lines with Omega joints.



Please ask for our Prospectus No. 0597

Our technical staff will be glad to advise you.

PHOENIX-RHEINROHR AG
VEREINIGTE HUTTEN- UND RÖHRENWERKE DUSSELDORF
GERMANY

A New Name . . .
For An Old Hand In
OIL FIELD SERVICES

P G A C

Pan Geo Atlas Corp.

FORMERLY:

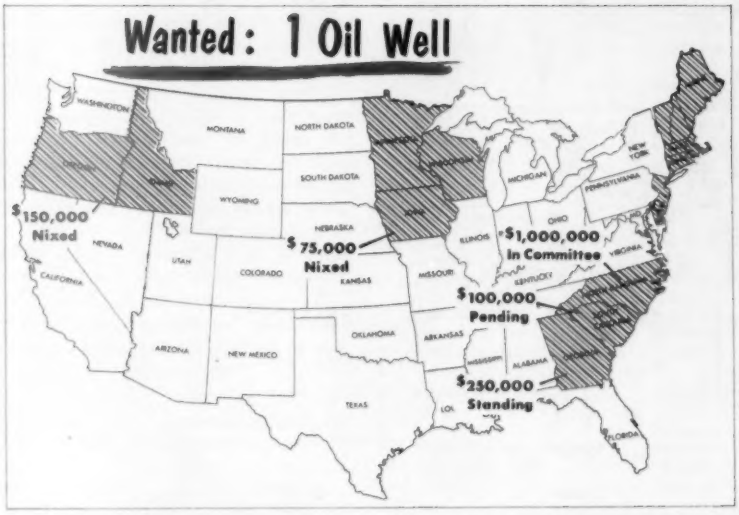
Perforating Guns Atlas Corporation

PAN . . . . denotes PGAC's world-wide operations
GEO . . . . denotes PGAC's geological applications
ATLAS . . denotes PGAC's original name (1946)

598

7730 SCOTT STREET HOUSTON 21, TEXAS
Phone: RE public 4-1651 P. O. Box 14524

PGAC is a Subsidiary of
CHEMETRON
CORPORATION



ONLY ONE NONPRODUCTIVE STATE has an actual reward posted for the first oil well; Georgia offers $250,000 bonus for the first 100-bbl. well there. Other states have entertained the idea of a bonus, but needed legislation failed to pass.

Dry states have mixed emotions about oil

BY FRANK J. GARDNER

IN A RECENT Journal story on a key duster in Iowa (OGJ, July 27, p. 100), mention was made of two attempts to ram "reward" bills through the legislature, offering bonus money to the operator of the first commercial oil well in that state. Apparently this held a lot of interest for Journal readers, for we immediately received several letters asking for dope on other states that might have such carrots dangling before the wildcatter.

So we made a little survey. Letters went out to the governors of all nonproductive states, asking for this information. And the replies have been most interesting. Some states are eager, some cool, others resigned to the utter impossibility of oil.

The only place where an official reward stands unclaimed is **Georgia.** Here, a $250,000 bonus awaits the owner of the first 100-bbl. oil well. A constitutional amendment in 1956 won overwhelming approval in every county. Oil-hungry Georgia is so eager for christmas trees on its soil that it reversed the figures on an earlier reward offer of $100,000 for a 250-bbl. well. So far, the $250,000 goes unclaimed.

Apparently, **North Carolina** would like to outdo Georgia, but its authorizing bill never came out of committee. State Geologist Stuckey replied: "At the 1957 session of the General Assembly, Rep. Dellinger introduced House Bill No. 4, to amend the constitution in order to allow the General Assembly to make an appropriation of $1,000,000 to be paid to the first person, firm, or corporation bringing in a successful oil well. This bill was referred to the committee on constitutional amendments and was never reported out."

South Carolina is more niggardly. They think the first well is worth only $100,000. A bill posting that reward was introduced in the last session of the legislature as a temptation "to anyone producing an active oil well within the state-owned lands." Note the new wrinkle there—it must be on state lands. The bill failed to pass, but is still pending.

Jumping to the West Coast, we find that the State of **Oregon** has played with this idea. And it had yet another novel approach. A bill submitted to the legislature in 1957 would have paid a $150,000 cash bounty "to the person or persons owning the first oil or gas well located **in each new field** in this state which, for a period of 2 years, yields oil or gas or both in commercial quantities." This bill passed the house and was referred to the senate committee on taxation. "As this was shortly before the legislature adjourned," writes State Geology Director Hollis M. Dole, "there was insufficient time to act upon it and the bill died in committee." A similar bill was prepared for the 1959 session, but was never introduced.

Oregon's approach is generous indeed. A $150,000 bonus for the discovery well of each new field might have bankrupted the State of Texas many years ago. Obviously, Oregon doesn't anticipate a rash of oil fields.

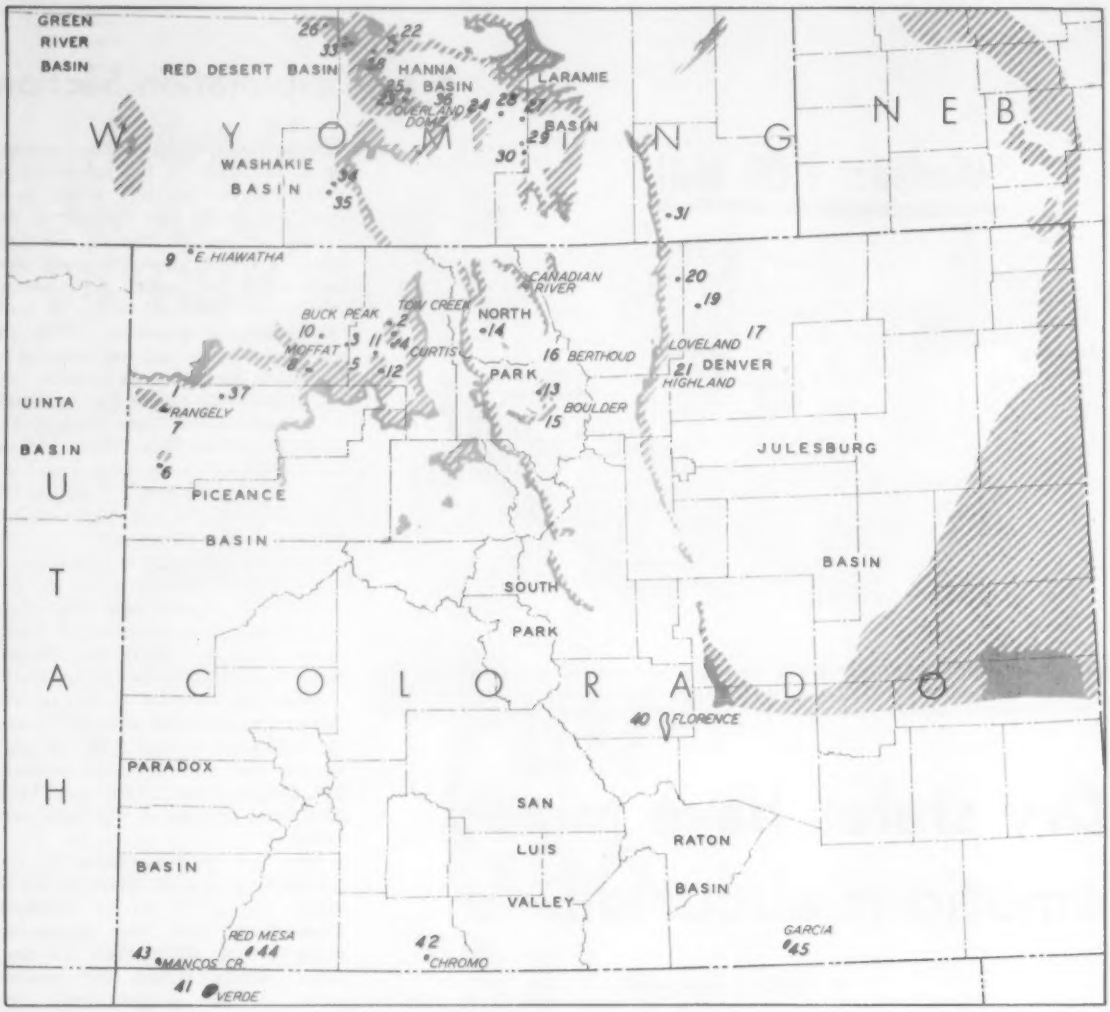
Iowa, the cause of all this investigation, has seen two attempts to lure the wildcatter to that state. At each of the last two legislative sessions, bills ranging from $25,000 to $75,000 have been introduced, but both were defeated.

The New England States are understandably reticent about the whole thing. The governors of **Vermont, Connecticut,** and **New Hampshire** dismissed the whole thing in short notes. **Rhode Island,** the smallest state, sent the longest letter, and added: "There is only a remote possibility that oil or natural gas might be found offshore." **Massachusetts** added a wistful "Unfortunately, Massachusetts does not include petroleum among its natural resources." **Maine** didn't deign to answer.

Minnesota has little hope and has offered nothing. **Wisconsin** ignored us. So did **Idaho. Delaware** said "No." **New Jersey's** Governor Meyner wrote: "New Jersey has the second-oldest geological survey in the country . . . and we seem to have sufficient knowledge about the geology . . . and the oil potentials so that as each new development takes place, oil companies have, on their own initiative, made investigations which have taken advantage of new techniques or new knowledge."

Alaska, our forty-ninth state, of course already has its oil. We didn't write **Hawaii.**

And that's the story of the bounty on oil. Which state has the best chance to become the thirty-fourth producer? We'd guess Iowa, Oregon, Idaho, Georgia, and the Carolinas, in that order.



SOLID areas are Niobrara outcrop patterns. Hatched portion shows where Niobrara is less than 2,500 ft. from surfaces. See facing table for number key. Fig. 1.

In the Niobrara . . .
Oil may yield to special methods

About the author . . .

E. A. McAuslan

EDWARD R. McAUSLAN made a study of the Niobrara which was the outgrowth of a wide-range program involving correlation problems of the Cretaceous in Wyoming and Colorado. The resulting correlations revealed that the Niobrara had a number of stratigraphic equivalents. In many areas possible oil and gas pools were being overlooked due to lack of knowledge of Niobrara potentialities.

In drilling for the Frontier, Cloverly, Sundance, and Tensleep producing horizons, the Niobrara was drilled through at high speeds without evaluation. This paper is an attempt to classify Niobrara stratigraphy and emphasize that usual methods of exploration, drilling, and completion are wholly inadequate for the Niobrara.

Since 1953, the author has been a petroleum geologist in the oil development department of Union Pacific Railroad Co., Rawlins, Wyo.

THE OIL AND GAS in the Niobrara occur in cracks, fissures, fractures, breaks, and other openings in shale. No particular horizon on a regional basis appears to contain the most oil. Production is limited only by the location of the fractures.

At Overland Dome in Wyoming, the shows of oil and gas are at the top of the Niobrara, whereas at Buck Pass in Colorado the oil is found some distance beneath the top, in the vicinity of the first chalk and lower. Lateral variations in production also seem to be controlled by fracture extent and location, resulting occasionally in dry offset wells.

Two important aspects have become increasingly apparent: the most

prominent idea is that the Niobrara is probably a source bed and therefore its contained hydrocarbons are indigenous to it; the second aspect is that the Niobrara may have been, and may still be, a low-grade oil shale.

If the Niobrara is truly a source bed it is possible that other reservoir rocks above and below it may have derived their oil and gas from the organically rich Niobrara shales. The other rocks may even be those of the Cloverly and Mesaverde groups when it is remembered that the Niobrara in some areas is quite thick, as in western Wyoming where there is as much as 3,300 ft. of the formation.

The above statements, since they cannot be proved, are offered as suggestions for contemplation.

To substantiate that the Niobrara is a source rock, a number of surface samples were collected and sent to the Bureau of Mines laboratory in Laramie for assaying. The analyses indicated the presence of from 10 to 12 gal. of oil per ton of rock.

In an article in the AAPG Bulletin of March 1956, members of the Carter Oil Research Laboratory in Tulsa reported that Niobrara samples from the Powder River basin of Wyoming possessed as high as 630 bbl. per acre ft. of kerogen. The Bureau of Mines laboratory estimated that 630 bbl. per acre ft., on the basis of Green River oil-shale assays, would be equivalent to 7.8 gal. per ton. This oil yield is about one-third the yield derived from commercial Green River oil shale which contains about 25 gal. of oil per ton of rock.

If the Niobrara is a source rock for petroleum, it should follow that where fractures exist hydrocarbons should be obtained, and the more extensive the fracture system, the better the well.

On the surface, Niobrara fractures are frequently evidenced by nearly vertical calcite-filled veins or rubble, and calcite is frequently recovered in well cuttings. Whether the surface fractures are the same as those at depth is purely speculative. The amount of calcite in a well appears to have little to do with the amount of oil produced, as many wells which produced large quantities of oil had much calcite, other wells equally good had no calcite, and many dry holes have indicated large quantities of calcite. The connection between oil and calcite may be purely coincidental where fractures exist; the openings allow access to percolating waters containing calcium carbonate in solution. It has been suggested that the calcite served as a propping agent for the fractures but this idea has not been borne out conclusively.

The size of the fractures varies from minute to cavernous. Occurrences of fractures have been noted where drilling tools would drop away for distances as much as 15 ft. Occasionally in rotary drilling large amounts of lost circulation material have been used without success.

The cause and development of a fracture system in the Niobrara is not completely understood. It would seem, however, that it is a brittle formation and fractures rather easily with no large amount of regional deformation. If severe movement were required for the formation of fractures, it seems that other sediments not of Niobrara age would be fractured also; this is rarely the case.

A syncline might be an excellent place to prospect for Niobrara oil since the synclinal folding would have produced enough movement to create fractures coupled with the idea that the oil accumulation is gravity-controlled.

Structural closure is not required to entrap hydrocarbons in a fractured reservoir. A number of producing Niobrara fields are situated on closed anticlines as Rangely, Tow Creek, and Buck Peak. There are other fields not on closed features such as GP in Wyoming and the famous Florence field in Colorado. Florence is not producing from the Niobrara, but from the Pierre shale overlying the Niobrara; nevertheless, the physical characteristics of the reservoir are very similar to that of the Niobrara in that the oil is coming from a fractured shale, and the field is not located on a closed structure.

Niobrara oil is always of high gravity, generally ranging from 30° to 40° with occasional gravities as high as 42°. It is a waxy, paraffin-base crude, and the high quality results in a better-than-average price for the product.

Water is rarely found in the Niobrara formation. At Smoky Gap field in Central Wyoming some water is produced with the oil. At Tow Creek in Colorado large quantities of water have been found. However, there is doubt in the minds of some operators at Tow Creek that the produced water is actually Niobrara water; there is a possibility the water was introduced by wells in the early days which bottomed in deeper sand formations, allowing seepage. Smoky Gap and Tow Creek are the only two fields known at present to be making water.

TABLE 1—FIELDS PRODUCING FROM NIOBRARA FORMATION

Map No.	Field—	State	Formation	Cumulative prod.	Gravity	Remarks
1	Rangely	Colo.	Mancos	5,500,000 bbl.	52	3,020 acres
2	Tow Creek	Colo.	Niobrara	2,500,000 bbl.	36	Rec. 7,000 bbl. per acre
3	Buck Peak	Colo.	Niobrara	156,000 bbl.	39	Disc. 1957, 4 wells, IP 200 BPD
4	Curtis	Colo.	Niobrara	41,000 bbl.	38	Disc. 1957, IP 185 bbl.
5	Moffat	Colo.	Mancos	2,300 bbl. +	38	Disc. 1953
16	Berthoud	Colo.	Niobrara	Gas, 1,175 M.M.c.f.	..	Disc. 1927, 2 recent rotary holes failed
17	Loveland	Colo.	Timpas	74,145 bbl.	41	Disc. 1957
18	Wray	Colo.	Niobrara	Gas	..	Abandoned
21	Highland	Colo.	Niobrara	Oil	..	Small oil prod.
22	GP	Wyo.	Niobrara	181,871 bbl.	36	1,200 bbl. per acre
	Pilot Butte	Wyo.	Niobrara	1,000,000 bbl.	37	3,300 bbl. per acre
	S. Big Piney	Wyo.	Hilliard	Gas	..	Disc. 1953
	N. La Barge	Wyo.	Hilliard	564,869 bbl.	45	Disc. 1928
	Big Muddy	Wyo.	Niobrara	400,000 bbl.	33	Disc. 1916
	Salt Creek	Wyo.	Niobrara	4,000,000 bbl.	37	Disc. 1906, IP 2,250 bbl.
	Teapot	Wyo.	Niobrara	178,587 bbl.	34	Disc. 1922
39	Canadian R.	Colo.	Niobrara	.....	..	Disc. 1957, prod. 10 BPD
40	Florence	Colo.	Pierre*	15,000,000 bbl.	31	Disc. 1876
41	Verde	N. Mex.	Gallup	1,200,000 bbl.	..	.....
42	Chromo	Colo.	Mancos	124,218 bbl.	32	May not be Niobrara
43	Mancos Creek	Colo.	Mancos	5,797 bbl.	40	Rec. 290 bbl. per acre
44	Red Mesa	Colo.	Mancos	.....	37	.....
45	Garcia	Colo.	Mancos	Gas	..	May be Codell sandstone
	Tip Top	Wyo.	Hilliard	Gas	..	.....
	Smoky Gap	Wyo.	Niobrara	27,000 bbl.	..	New field

*Not Niobrara equivalent but fractured shale. Unnumbered fields are not on map (Fig. 1).

Stratigraphy

The Niobrara formation, the youngest member of the Upper Cretaceous Colorado group, was first named by Meek and Hayden in 1882 from exposures along the Missouri River in Knox County, Nebraska. The upper part is a lead-gray calcareous marl which weathers to a white or chalky appearance, and the lower part is light yellowish and white limestone. The thickness at the type locality is about 200 ft. Throughout the Rocky Mountain region the lithology of the Niobrara remains somewhat similar to

TABLE 2—SOME FIELDS PRODUCING FROM FRACTURED FORMATIONS

Field—	State	Formation	Cumulative production	Remarks
Gilbertown	Alabama	Selma chalk	1,000,000 bbl.	Frac. Cretaceous chalk
22 Fields	Texas	Austin chalk	8,500,000 bbl.	Frac. Cretaceous chalk
Eastern Kentucky	Kentucky	Devonian	Gas — 500 billion cubic feet or more	Frac. Devonian shale Reserves over 1 trillion feet of gas
Santa Maria	California		290,000,000 bbl.	Frac. shale and chert

that in Nebraska in that it is primarily a calcareous shale, but in various areas contains several so-called chalk beds which are outstanding on their weathered outcrop due to the bright white appearance and offer excellent mapping markers. The chalk beds consist of abundant oyster fossils of the type Ostrea congesta, and numerous foraminifera.

The first chalk and the calcite veining aptly display the faulting frequently found in the Niobrara and such faulting is indicative of fracturing within the formation. The veins of calcite prove that openings existed to accept waters containing carbonates in solution.

The individual chalks curiously enough are present in South Central Wyoming, and in North Central Colorado, just west of the Front Range, but are absent in eastern Wyoming, western Wyoming, eastern Colorado east of the Front Range, and in western Colorado. However, whether or not the chalks are present in any given area, the calcareous resistive shales typical of the Niobrara persist.

On the surface, the contact between the Niobrara and the overlying Steele in Wyoming, the Pierre in eastern Colorado, and the Mancos in western Colorado, is very difficult to select. Actually the first chalk bed, some distance below the top of the formation, is the first recognizable Niobrara type rock, though careful work will reveal sediments with Niobrara characteristics above the first chalk.

The base of the Niobrara is characterized by what is known as the concretionary zone, below which the sediments become almost noncalcareous. The noncalcareous material belongs either to the Carlile in its latest stages or to a separate and distinct formation.

Dr. Thomas of the University of Wyoming has determined that the fossils in this noncalcareous zone, which he calls Saga Breaks, are of an age younger than true Carlile, and he suggests that the Sage Breaks is a lower member of the Niobrara. However, for the purposes of this paper the Niobrara is considered to be that series of rocks above the Sage Breaks and below a certain point of high resistivity on electrical logs.

Dr. LeRoy of the Colorado School of Mines has found that there is a distinct faunal break between the overlying Sharon Springs member of the Pierre and the top of the Niobrara in eastern Colorado. He believes that the Sharon Springs shales were laid down under stagnant, acid-bottom marine conditions, whereas the upper Niobrara beds were deposited in a well-oxygenated marine environment conducive to the growth of pelagic life.

TABLE 3—SHOWS OF OIL AND GAS FROM NIOBRARA FORMATION

Map No.	Area	State	Formation	Type of show	Remarks
6	Douglas Creek	Colo.	Mancos	Gas	Well blew out
7	Rangely, SE	Colo.	Mancos	Oil	Good oil shows
8	Iles	Colo.	Mancos	Oil	
9	Hiawatha	Colo.	Mancos	Gas	
10	Craig	Colo.	Mancos	Gas	Small field at one time
11	Sage Creek	Colo.	Niobrara	Gas	Shows of 128 M.c.f.
12	Fish Creek	Colo.	Mancos	Oil and gas	Unclosed anticline
13	Granby	Colo.	Niobrara	Gas	
14	Coalmont	Colo.	Niobrara?		
19	Pierce	Colo.	Niobrara	Oil	Oil on mud pits
20	Wellington	Colo.	Niobrara	Oil	
23	Airport Nose	Wyo.	Niobrara	Oil	300 ft. of oil fillup at 1,200 ft.
24	Overland Dome	Wyo.	Niobrara	Oil	Oil fillup of 2,500 ft., swabbed 125 BOPD, one well produced 6 BOPD for several years.
25	Cedar Ridge	Wyo.	Niobrara	Oil and gas	70 BOPD, and 5 M.M.c.f. gas at a depth of 10,122 ft.
26	Lost Soldier	Wyo.	Niobrara	Oil	
27	Diamond Ranch	Wyo.	Niobrara	Gas	Strong gas shows on mud logger
28	S. Big Medicine Bow	Wyo.	Niobrara	Gas	
29	Dutton Creek	Wyo.	Niobrara	Gas	
30	Cooper Cove	Wyo.	Niobrara	Oil	
31	Borie	Wyo.	Niobrara	Oil and gas	
32	O'Brien Springs	Wyo.	Niobrara	Gas	Good gas shows on mud logger
33	Lost Soldier	Wyo.	Niobrara	Gas	Strong gas blow
34	Deep Creek	Wyo.	Mancos	Gas	
35	Dad	Wyo.	Mancos	Gas	
36	Saratoga	Wyo.	Niobrara	Gas	3 M.M.c.f. gas burned rig
37	White River	Colo.	Niobrara	Gas	
38	O'Brien Springs	Wyo.	Niobrara	Oil	Good show amber oil

Electric-log characteristics . . . The top of the Niobrara shows electrical logs above a distinct increase in resistivity suggestive of the lesser conductivity to electricity of the fossils present as the result of the more desirable faunal environment.

The limits of the Niobrara can be selected from electrical logs, of which more than 200 were used for correlation, more easily than from surface exposures or from well cuttings. In cuttings, the top of the formation is very difficult to pick unless there is an electrical log at hand.

Generally the first chalk can be found in samples and is denoted by an abundance of brown-speckled calcareous shale. The brown-speckled shale can be found above the first chalk but in lesser quantities. The specks are probably forams. A sample group of electrical logs (Fig. 2) indicates the limits of the Niobrara with the top selected at the increase in resistivity and the base selected at the base of the concretionary zone which possesses much lesser resistivity.

An isopachous map (Fig. 4) of the Niobrara is based on electrical-log data and uses the previously mentioned formational boundaries. The thickest section occurs near the western border of Wyoming and thins to the east to a minimum of 300 ft. in the southwestern corner of Nebraska. The Denver basin region possesses the most uniform thickness but thickens gradually to the southeast until it reaches the Niobrara outcrop.

In western Colorado, the formation reaches a maximum of about 1,900 ft. and also thins to the east. The gaps in the contours are where the mountain ranges are present in Colorado and southeastern Wyoming and the lack of contours in the central portion of Wyoming is the territory of the Great Divide basin where no wells have yet penetrated the Niobrara.

Niobrara Equivalents

As a result of this study, it has been learned that there are several formations which are equivalent to the Niobrara in time and lithology in whole or in part (Fig. 3). The electrical-log similarity in most cases is sufficiently correlative so that it is assumed that certain sediments have been deposited and derived under

New Method for

CASING LEAK REPAIRS!

in the hole...

with HALLIBURTON CASING PATCH APPLICATOR

A new and unique aid for repairing leaks in casing—while still in the hole—with industry proven, woven glass-fabric and plastic laminate. Also ideal for helping to provide permanent or temporary sealing of perforations without contaminating formation.

This laboratory and field-tested technique employs a specially designed inflatable mandrel which carries the woven glass-fabric-plastic patch to the leak point, and with application of pressure forms the patch to the inside diameter of the casing. Excess plastic is forced out of the leaking point, forming a seal both inside and outside the casing.

The Casing Patch reduces the inside diameter of the casing in the repaired area by approximately ¼" and provides smoothly tapered edges from minimum I.D. to original casing I.D.

Many successful applications have already been completed, at depths of from 200 ft. to over 5000 ft.

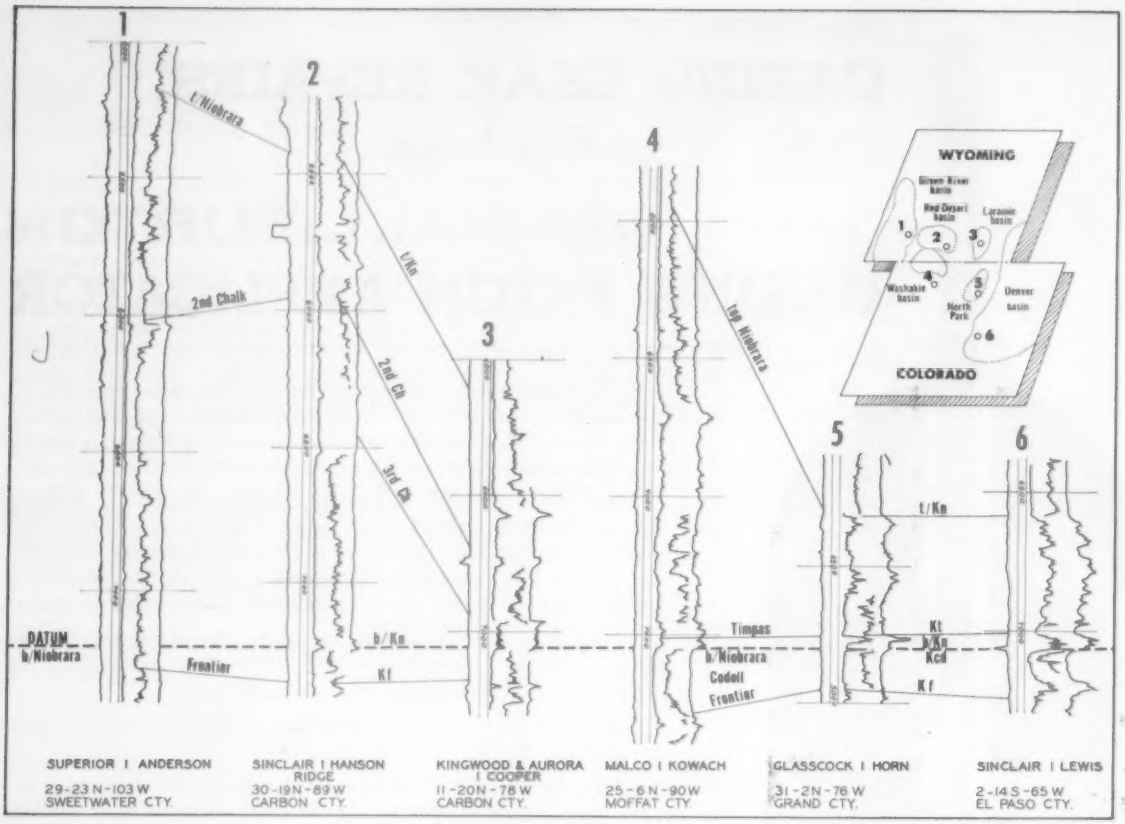
After the Casing Patch Applicator is removed from the hole, usual tests to determine stabilization of the patch area are made and the well is ready for work resumption.

It will pay you to investigate this most advanced technique as an aid for casing leak repair. Contact your nearby Halliburton Representative.

HALLIBURTON

SPECIAL TOOLS SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA



ELECTRIC-LOG characteristics of the Niobrara are depicted in these wells in southern Wyoming and northern Colorado. The concretionary zone with its high resistivity as compared to the lower resistivity of the Sage Breaks shale is an excellent marker for distinguishing the base of the Niobrara. Fig. 2.

conditions akin to that of the Niobrara.

Wyoming

The Hilliard formation is known in western Wyoming where it was first named by W. C. Knight in 1902 from exposures near Hilliard Flat, Uinta County, Wyoming. The Hilliard is almost entirely shale, varying from drab to gray with a few bands of sandstone. It overlies the Frontier and underlies the Laramie group, specifically the Adaville formation, a Mesaverde equivalent.

Veatch in 1907 measured from 5,500 to 6,800 ft. of Hilliard. In the basal part there are 1,800 ft. of shales containing the fossil Inoceramus exogyroides, characteristic of the basal Niobrara east of the Rocky Mountains. Cobban and Reeside also identified marine Niobrara fossils from the Hilliard.

Baxter formation . . . The Baxter shale occurs in southwestern Wyoming where it is a black and drab shale, soft and friable, has shaly sandstone and arenaceous shale in places, and in some areas is highly gypsiferous. The thickness of the Baxter is from 3,350 to 3,600 ft. A horizon 78 ft. below the top of the Baxter shale has been termed the "marker bed" as it is a distinctive fossil zone containing Desmoscaphites bassleri marking the boundary between the Colorado and Montana groups. The Niobrara is uppermost Colorado in age and as the marker bed is at the base of the Montana group. It follows that the shale of the Baxter below the marker bed is of Niobrara age.

Cody formation . . . The Cody shale is gray and dark gray with a thickness of 3,360 ft. as an average, and includes the Steele and Pierre shales in the upper part and the Niobrara in the lower part. The Cody is overlain by the Mesaverde and underlain by the Frontier. In many areas where the name Cody is used it is very difficult on the surface to distinguish between the Steele and the Niobrara even though the Niobrara shales are darker and much more calcareous than those of the Steele. However, on electrical logs the contact between the Steele and the Niobrara can readily be determined since the calcareous nature of the Niobrara is represented by increased resistivity.

Beaver Creek chalky member . . . This member is in the upper part of the Niobrara of northeastern Wyoming and southeastern Montana and consists of chalk marl and calcareous siltstone, gray where fresh, but weathers to a light yellow and contains marine Niobrara fossils.

Colorado

The Apishapa shale is the upper member of the Niobrara in eastern Colorado and consists chiefly of argillaceous laminated shale, dark gray, weathering yellowish. The Apishapa correlates with the upper chalk, the upper shale, and the lower chalk, of the Laramie region of Wyoming. The Apishapa underlies the Pierre shale and overlies the Timpas limestone, the lower member of the Niobrara.

Timpas limestone . . . This limestone occurs in eastern Colorado, eastern Wyoming, and northeastern New Mexico, and is a series of limestones and calcareous shales of prevailing blue colors. The Timpas is the lower member of the Niobrara underlying the Apishapa shale. The Carlile formation rests beneath the Timpas. The Timpas is widely used as a marker

STRATIGRAPHIC CHART OF CRETACEOUS ROCKS

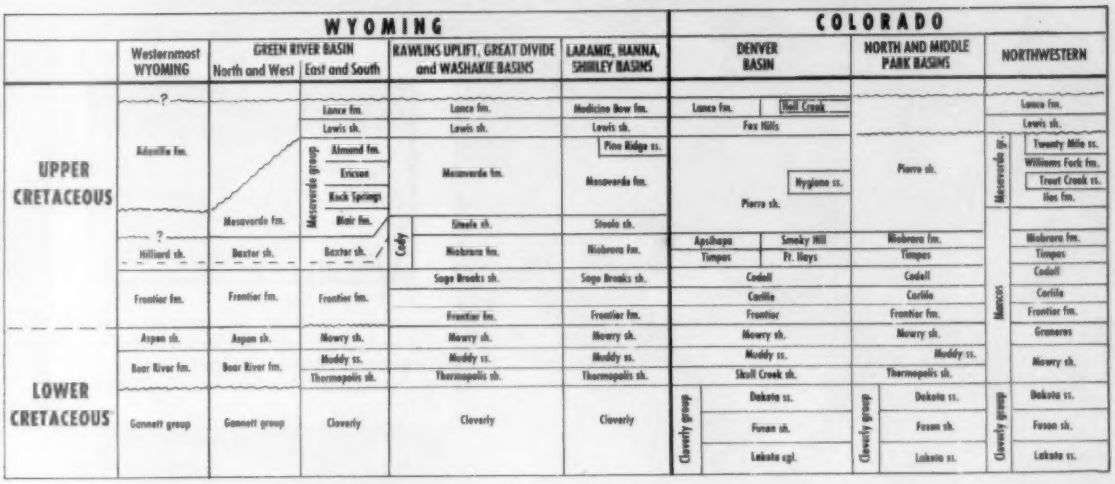


CHART OF CRETACEOUS sediments relates the Niobrara formation to other rocks in the stratigraphic column in southern Wyoming and northern Colorado. Fig. 3.

bed both on the surface and in the subsurface due to its resistance to eroison and to the electrical current.

Smoky Hill formation . . . The Smoky Hill consists of chalky and marly limestones and chalk composing the upper part of the Niobrara in northwestern Kansas and eastern Colorado, and the North Park area of north central Colorado. The Smoky Hill was deposited on the Fort Hays limestone, the lower member of the Niobrara.

Fort Hays limestone . . . The Fort Hays is found in western Kansas, eastern Colorado, and eastern Wyoming, and is characterized by heavy stratified chalk or soft white limestone at the base of the Niobrara beneath the Smoky Hill. The character of the Fort Hays, like that of the Timpas, is unmistakable wherever seen. In the North Park region of North Central Colorado, the Fort Hays constitutes the lower 14 ft. of the Niobrara.

Mancos shale . . . The Manos is widespread in western Colorado, western New Mexico, eastern Utah, and southern Wyoming. The shale is dark gray in color and contains thin calcareous layers which in places become almost limestone and are usually rich in fossils. Sand in the Mancos locally increases to become sandstone. The formation attains thicknesses as great as 2,500 ft. and the upper half is of Montana age.

As the Colorado group, of which the Niobrara is the upper member, lies beneath the Montana group, the shales immediately below those of Montana age are within the Niobrara and contain Niobrara fossils. According to Reeside in USGS pp. 134, 1924, the Mancos shale of southwestern Colorado and northwestern New Mexico grades at the base into the Dakota group and into the overlying Mesaverde group. Within the Mancos there are fossils of Greenhorn, Carlile, Niobrara, and Pierre age. The Niobrara fossils are present about 800 ft. above the base of the Mancos.

New Mexico

This paper does not involve studies in New Mexico in detail, but there are several formations of Niobrara age which are presently producing large amounts of oil, and are, therefore, worthy of note. The Gallup sandstone, a tight, hard, fractured sand body, becoming in places a siltstone and even a shaly sandstone, is possibly a tongue of the Mesaverde in the Niobrara, as it possesses Mesaverde lithology but carries Niobrara fossils. The Tocito is another sediment capable of commercial production which is probably of Niobrara age.

Drilling for Niobrara Oil

Many of the oil fields were discovered by use of cable tools, such as Rangely, Tow Creek, GP, Berthoud, Wray, and Florence. Buck Peak and Curtis were found with rotary equipment. In a cable tool hole the detection of oil, if present in even moderate quantities, presents no difficulties.

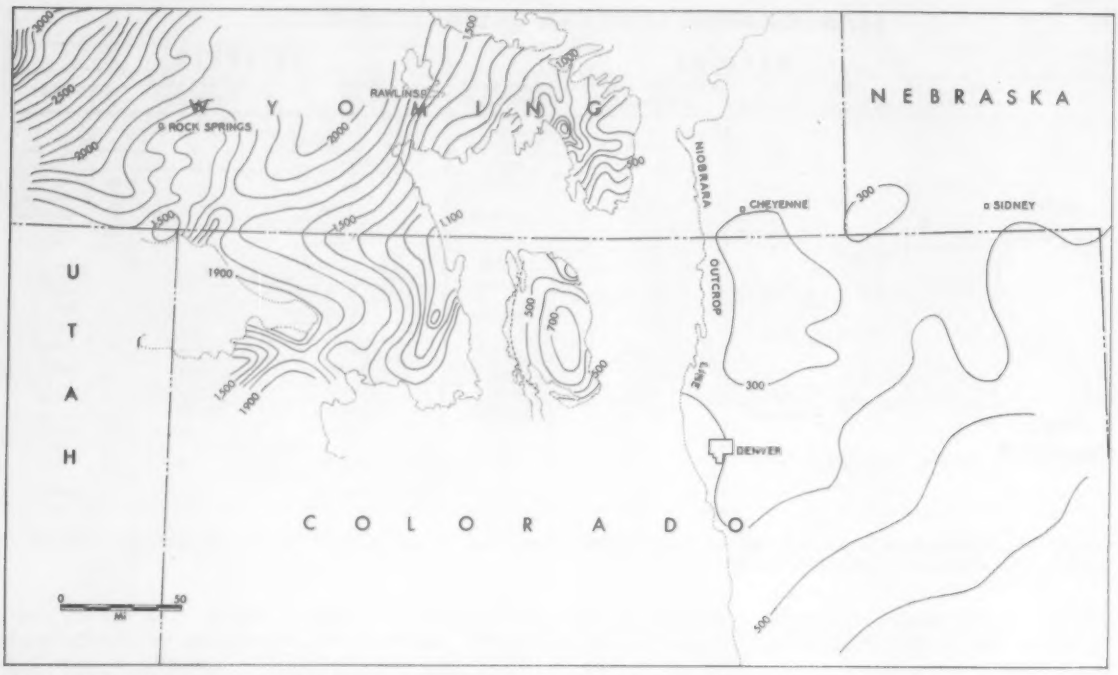
There is little water used in drilling a cable well to obscure small amounts of oil or gas, nor is there any heavy mud which might tend to seal off small fractures. The use of rotary tools offers some very serious problems in the detection of even large amounts of oil or gas, especially when in nearly every case the hydrocarbons in the Niobrara are under subnormal pressures as proved by past histories.

Samples and cuttings from rotary holes are seldom of much value in determining the extent of fracturing and the amount of available oil. Cores of a fractured shale also are of minor importance. When the discovery well of Buck Peak field was drilled, the only indication of oil was a slight amount of fluorescence on one piece of calcite in a core, while the entire core appeared to look like a series of silver dollars. In Zaca Creek field of California, a fractured reservoir, oil is sometimes indicated on the fractures from cuttings, but this oil has a very low gravity of 8.5°. Light oils such as those from the Niobrara, which range from 30°-40°, seldom show up in cuttings.

Mud-logging equipment aids to a certain extent in detecting shows of oil and gas, but there have been instances where a show was not tested because the operator could find no sign of sand in the cuttings.

One of the best indications, in a rotary hole, that testing might be warranted, is where lost circulation is encountered. Lost circulation in shale indicates fractures. At Buck Peak, lost circulation was experienced, and on this basis only drill-stem tests were run which proved the field.

The recognition of fractures from electrical logs is not easy. In an area that has been drilled, experience will sometimes permit a person to select



ISOPACHOUS MAP denotes the thickness of the Niobrara. Note that the thickest section occurs near the western Wyoming border. This is contrasted to Fig. 1 where the Niobrara outline displays where Niobrara exists at depths of 2,500 ft. or less from the surface. Fig. 4.

fracture locations within the Niobrara from micro and sonic logs. In Buck Peak field, if the self-potential is well developed in the Niobrara, there results a flowing well, but where there is little or no self-potential, the section is dry.

Some years ago it was discovered, at a field in Mexico, that subsurface fractures could be located seismically by the absence of reflections, but it is not known whether this can be duplicated at other fields.

If a drill-stem test is run, it should be done immediately, before the mud has a chance to invade and seal the fractures. However, it is now believed that if the mud is allowed to be opposite the fractured interval for any time, however slight, the fracs will be closed. The tool should be open longer than usual to permit the low-pressure gas or oil to enter the tool. The test interval should be as long is practical and safe, for generally it requires numerous fractures to produce commercial amounts and the longer the test interval the more fractures are likely to be involved.

The danger of rotary muds penetrating the Niobrara fractures is very real, and is generally the reason for only slight shows being evident. Many wells have failed to find commercial production because the fractures were plugged by mud.

With cable tools there is no danger from plugged fractures, and there is little danger of blowouts because of the low pressures. Air drilling has proved successful in some regions, and in others no formation penetration could be made for the oil in the hole balled up the samples badly. Introduction of oil with the drilling mud sometimes works but there is still considerable mud pressure involved.

If time is an important element in the completion of a well, rotary tools could be used to a short distance above the Niobrara and a conversion to cable tools could then be made. If time is not important, or the formation is shallow, cable tools could be used all the way. In a number of areas the Niobrara is at the surface, and as there is rarely water associated with it, no water string would be necessary, further decreasing costs.

Open-hole completions have been tried and found successful at Rangely, but a slotted liner is required at Buck Peak. Cemented and perforated pipe is not good, for the cement penetrates the fractures, and they are forever sealed.

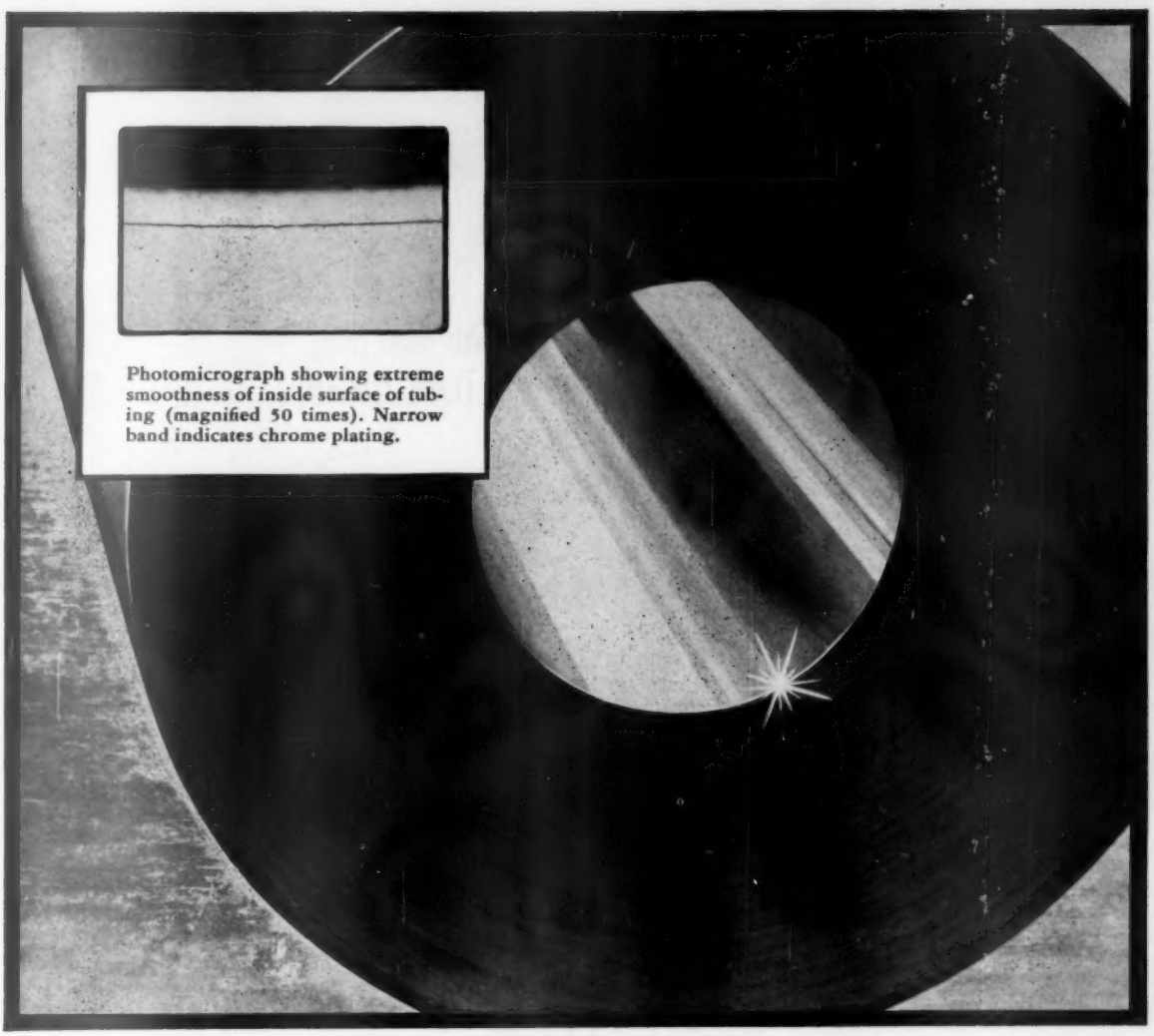
Swabbing has been found to be dangerous, on occasions, as there is a tendency for the swab to pull in the formation so as to seal the fractures and cave the hole. In the same manner, drill-stem testing offers possibilities of severe caving when the tool is opened.

The Niobrara (Fig. 1) can be found in many localities at depths less than 2,500 ft. At Rangely, the Mancos is at the surface, proving that no cap is necessary to seal the oil and gas in the formation as is required in a sandstone reservoir.

An area may be selected where the formation is at a reasonable depth, and then indications of fracturing or the possibility of fracturing should be noted. Calcite veins or rubble is always indicative of fractures, though there is no guarantee that the cracks will persist at depth. If the first chalk bed is exposed, faulting often will be noted, and thus more evidence of fracturing.

Folding of any kind will probably produce fractures, and synclines as well as anticlines should be considered seriously. The Niobrara is mapped (Fig. 4) only in southern Wyoming and northern Colorado, but the outcrops extend much farther over both states, as does the contact point where the depth to the Niobrara will not exceed 2,500 ft. Further detailed study should be made of the shows that have been encountered in the Niobrara and a likely location for future testing would be in the vicinity of numerous shows.

As in any fractured reservoir, offset wells to producers can be dry holes, depending on the pattern of openings so that a multiple well program must be instigated to explore thoroughly for future production. Due



Photomicrograph showing extreme smoothness of inside surface of tubing (magnified 50 times). Narrow band indicates chrome plating.

How to beat fatigue

caused by pulsating pressures up to 50,000 psi

PROBLEM: Manufacturers of polyethylene plastic were plagued by *costly* fatigue failures in the heavy wall, high pressure steel tubing they were using. *Result:* Costly, frequent replacements with attendant production and time losses.

CAUSE: The tubing's inside surface had slight, almost invisible imperfections which gave the pulsating pressures—varying between 35,000 and 50,000 psi—a toe hold for failures to start.

SOLUTION: Timken Company metallurgists recommended a specific low-alloy steel tubing that could be produced with a glossy-smooth interior surface. They used specially developed Timken Company processing techniques, based on more than 40 years of experience with all types of high pressure steel applications. Result—another special steel problem solved.

WHATEVER your special steel problem, it will pay you to use the experience of the experts—metallurgists of the Timken Company. Give us a call the next time you need help. The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

TIMKEN® *Fine Alloy* **STEEL**

to the fact that the Niobrara can be located near or at the surface, the costs will be low for a number of wells, and often, if intelligent exploration and completion is used, the quantity of oil or gas will be more than sufficient to be profitable.

Acknowledgments

Many people, too numerous to mention, have contributed generously to providing material discussed in this paper. Special thanks are due to the following: John Eckhoff, Joe Hopkins, and Richard Rhoades, oil-development department, Union Pacific Railroad; H. N. Smith, Bureau of Mines office in Laramie; Elmer Dunstan and Pete Harder, Denver photogeologists; Kenneth Cummings, Malco Refining, Denver; Gus Berninghauser, formerly of Malco Refining, Craig, Colo.; Robert Steed, Ohio Oil Co., Rawlins; Dr. E. D. Thomas, state geologist for Wyoming; Gene Eaton, Casper consultant; Galen Helmke, Casper consultant; Ralph Bryson, Vernal, Utah; Paul Pustmueller, Fremont Petroleum, Denver; Charles Lyden, Juniper Oil & Mining, Denver; Coleman D. Hunter, Kentucky West Virginia Gas Co., Ashland, Ky.; and Harry Whaley, Tidewater Oil Co., Ventura, Calif.

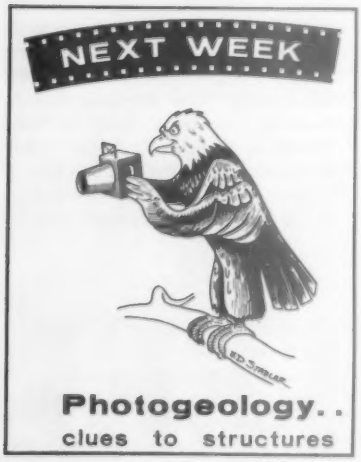
Oklahoma's Carter gets new Hunton pay

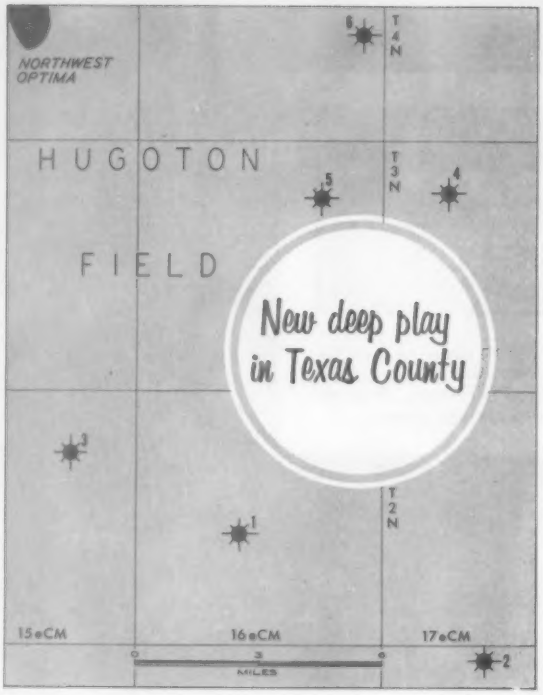
New Hunton Siluro-Devonian production is reported at a Carter County wildcat in southern Oklahoma. This new strike is Frankfort Oil Co. 1 Woodworth in NE NW 31-5s-3w. Initial flow was 2 bbl. hourly before treatment. Calculated potential of this well is 328 bbl. per day on 24/64-in. choke.

Gas reserve for Pakistan

An apparently large gas reserve was found by Standard Vacuum Oil Co. at Mari, 260 miles northeast of Karachi in Pakistan.

The company reports the well flowed 5 M.M.c.f.d. of gas. Gas was found while drilling for oil at the wildcat. Drilling down to 9,300 ft. has yet not uncovered any oil.





SOUTHERN Texas County in the Oklahoma Panhandle has another deep pre-Permian play in the making.

In Panhandle country

Tempo picks up in deep drilling

TEXAS COUNTY, scene of considerable pre-Permian exploration in the past few years, has a new deep-zone play shaping up. The new area is inside Hugoton field Permian gas production in the southern part of the Oklahoma Panhandle county.

Newest discovery of importance in this Texas County spree is Phillips Petroleum Co. 1 Hitch "I" (1 on map) in the NE SW 21-2n-16eCM, 9 miles west of Hardesty and 7½ miles northeast of Texas' Northwest Hitchland field. Phillips' well has a calculated absolute open-flow potential of 14,300 M.c.f.d. plus 130 bbl. of condensate per day from perforations in the Oswego Pennsylvanian lime at 5,828-42 ft.

Another discovery in the area is at Peerless Oil & Gas Co. and Jake L. Hamon 1 Wall (2 on map), SW NE 4-1n-17eCM, 5 miles southeast of the Phillips discovery. This well is shut in for potential after gaging 1,600 M.c.f.d. from perforations at 6,907-13 and 6,919-26 ft. in the Chester Mississippian.

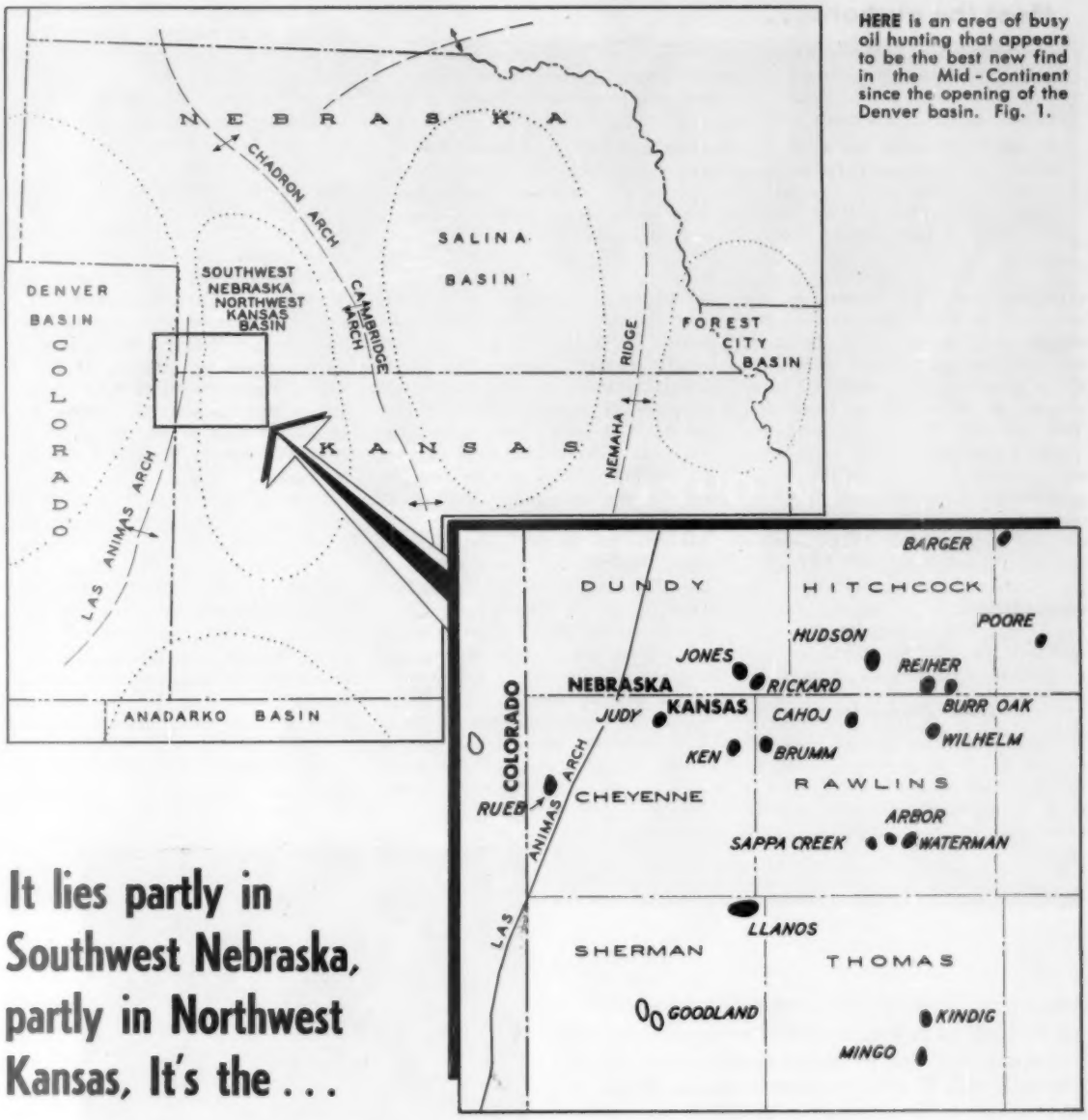
Skelly Oil Co. 1-A Montgomery "A" (3 on map), SE NW 11-2n-15eCM, 6 miles northwest of the Phillips discovery, is an indicated discovery in two zones. Operator is waiting for cable tools. Shell Oil Co. 1 Balzer (4 on map), C SW NE 8-3n-17eCM, 4 miles west of Hardesty Morrow field, is a Chester and Keyes sand discovery. Potential test is being planned. The well made 2,470 M.c.f.d. and 48 bbl. condensate per day from 6,360-87 ft.

Two other wells in the area, Cabot Carbon Co. (5 on map) 4 B. A. Calvert, and Shell 1-24 Wright (6 on map) are indicated strikes. The Cabot well, SW NE 11-3n-16eCM, flowed gas from perforations at 6,598-6,612 ft. Tests continue. The Shell well, C SW NE 24-4n-16eCM, flowed gas on drill-stem tests. Location is 7 miles east of Northwest Optima field, a Morrow oil and gas area.

West Kansas picks up new Mississippian field

A new Mississippian oil field was officially opened in western Kansas' Hodgeman County last week. Pickrell Drilling Co. completed the 1 Cox in C NW SW 9-21s-22w for 261 bbl. of oil daily from Mississippian perforations at 4,353-63 ft.

This new field is in the northeast part of the county, 7 miles northwest of Grayling and 1¼ miles northwest of the Wieland discovery well.



HERE is an area of busy oil hunting that appears to be the best new find in the Mid-Continent since the opening of the Denver basin. Fig. 1.

It lies partly in Southwest Nebraska, partly in Northwest Kansas, It's the . . .

Midwest's newest oil province

BY REX MONAHAN AND ROBERT D. RUTLEDGE

Editor's note . . . Since this paper was received for publication, two important discoveries have been added to the Kansas portion of the province. Skelly Oil Co. opened Wilhelm field at 1 Meyer in Rawlins County for a pump potential of 258 bbl. of oil daily from Lansing-Kansas City. The same week, Skelly completed the 1 Wicke as a confirmation well to Wilhelm field for 303 bbl. per day from the same zone.

RECENT exploratory efforts by Skelly Oil Co. in the Southwest Nebraska-Northwest Kansas basin have met with astounding success. The drilling of eight wildcat wells in Hitchcock County, Nebraska, and Rawlins County, Kansas, has resulted in five Pennsylvanian discoveries with pump gages of from 140 to 700 bbl. of oil per day. All of the discoveries have been in the multizone Lansing-Kansas City with one exception, an Oread completion.

With the exception of Skelly, most

Meet the authors . . .

Rex Monahan is a geologist and independent oil producer at Sterling, Colo. He began his Denver basin activities in 1950 after receiving BA and BS degrees from the University of Nebraska. From 1943 through 1946 he served in the U. S. Army as an infantry officer.

Robert D. Rutledge has been a consulting geologist in McCook, Neb., since 1956. Previously, he was a subsurface geologist with Texaco, Inc., in Jackson, Miss., and a wellsite geologist at Point Barrow, Alaska, for Arctic Contractors on Naval Petroleum Reserve No. 4. He graduated from University of Nebraska in 1950 with a BS degree.

other operators have adopted a "wait and see" attitude. Observers of the neighboring Denver basin, however, can well remember that its drilling activity sputtered along with 40 completions in 1949, 137 in 1950, and 392 in 1951. Yet during the year 1954, more than 1,700 wells were completed and the current rate is approximately 1,200 per year.

With granite-test drilling costs ranging from $18,000-25,000, multipay zone possibilities, 34° API gravity sweet crude and an excellent discovery ratio, it is not unreasonable to assume that the area under discussion will soon parallel the exploratory activity of the Denver basin. (Fig. 1).

Early Discoveries

Three years have passed since attention was first seriously focused on the Cambridge arch and adjacent areas of southwest Nebraska. It was in the spring and summer of 1956 that Cities Service Oil Co. established production in Warner field of northern Decatur County, Kansas, and M. P. Gilbert followed up with the Barger discovery in northwest Red Willow County, Nebraska. These discoveries precipitated an active lease play in Red Willow County and to some extent in the adjoining counties of Hayes and Hitchcock.

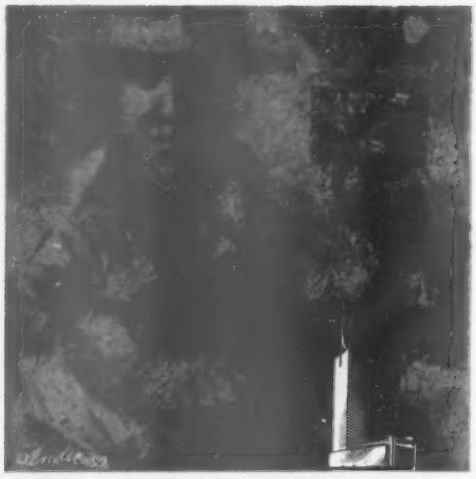
In spite of the relatively extensive acreage holdings of some majors in Red Willow, Hitchcock, southern Hayes, parts of Dundy and Chase counties by the end of 1956, development of the area for the next couple of years was limited to a few wildcats drilled by independents. These exploratory wells resulted in three small Nebraska discoveries: one in Dundy County, one in Hitchcock County, and one in Red Willow County.

In the spring of 1958, Skelly began drilling on an extensive acreage block in southern Hitchcock County. This drilling resulted in the Lewis discovery which, with the east offset being a producer, was soon defined on the west and south by dry holes.

Attention at about this same time was drawn to the adjacent areas of northwest Kansas with Phillips Petroleum Co.'s multizone discovery at the 1 Llanos, about 30 miles south of the Nebraska line in Sherman County. With this field developing favorably, and stimulated by several other discoveries northward, Skelly in May 1959, moved on location at the 1 Cahoj, 2 miles south of the Nebraska line in Rawlins County, Kansas, and at the 1 Reiher, 2 miles north of the Nebraska line in Hitchcock County, Nebraska.

Both of these wildcats resulted in multizone Lansing-Kansas City discoveries. Potential of the 1 Cahoj was reported as 528 bbl. per day and 348 bbl. on the 1 Reiher. Development drilling has resulted in five producers, including a 1¼-mile stepout in the Reiher area and at least four producers including a ¾-mile stepout in the Cahoj area. Neither of these areas has yet been defined by dry holes.

The Phillips 1 Llanos discovery in Sherman County, Kansas, in the spring of 1958 resulted in an intense lease



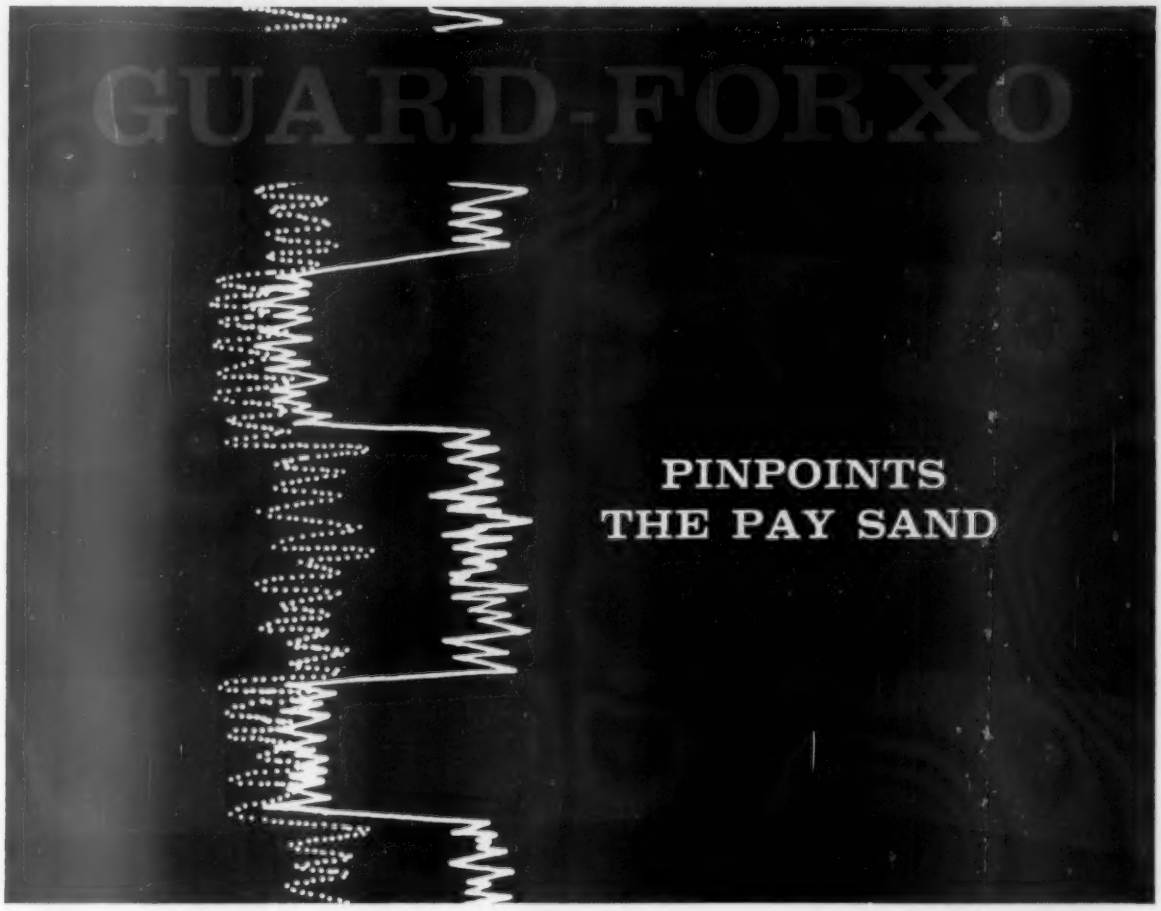
CONCENTRATION

Concentration on the needs and requirements of the oil producer—careful, expert attention to the demands of modern production financing — these are reasons why Republic is a leading oil bank of the South — with the South's largest Oil Department. How may we serve you?

REPUBLIC NATIONAL BANK
OF DALLAS

CAPITAL AND SURPLUS $100,000,000 • LARGEST IN THE SOUTH

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION



Welex's Guard-FoRxo log makes finding oil easier. If there is a pay sand present, the Guard-FoRxo pinpoints it with precision accuracy. Guesswork and complex computations are minimized. The Guard Log reads the uninvaded zone; the FoRxo measures the flushed zone. A comparison of the two curves results in a positive evaluation of the well, particularly in difficult-to-analyze wells where formation and mud resistivities are similar. Thin beds, shaly sands and rapid lithological changes are easy to analyze with the Guard-FoRxo combination.

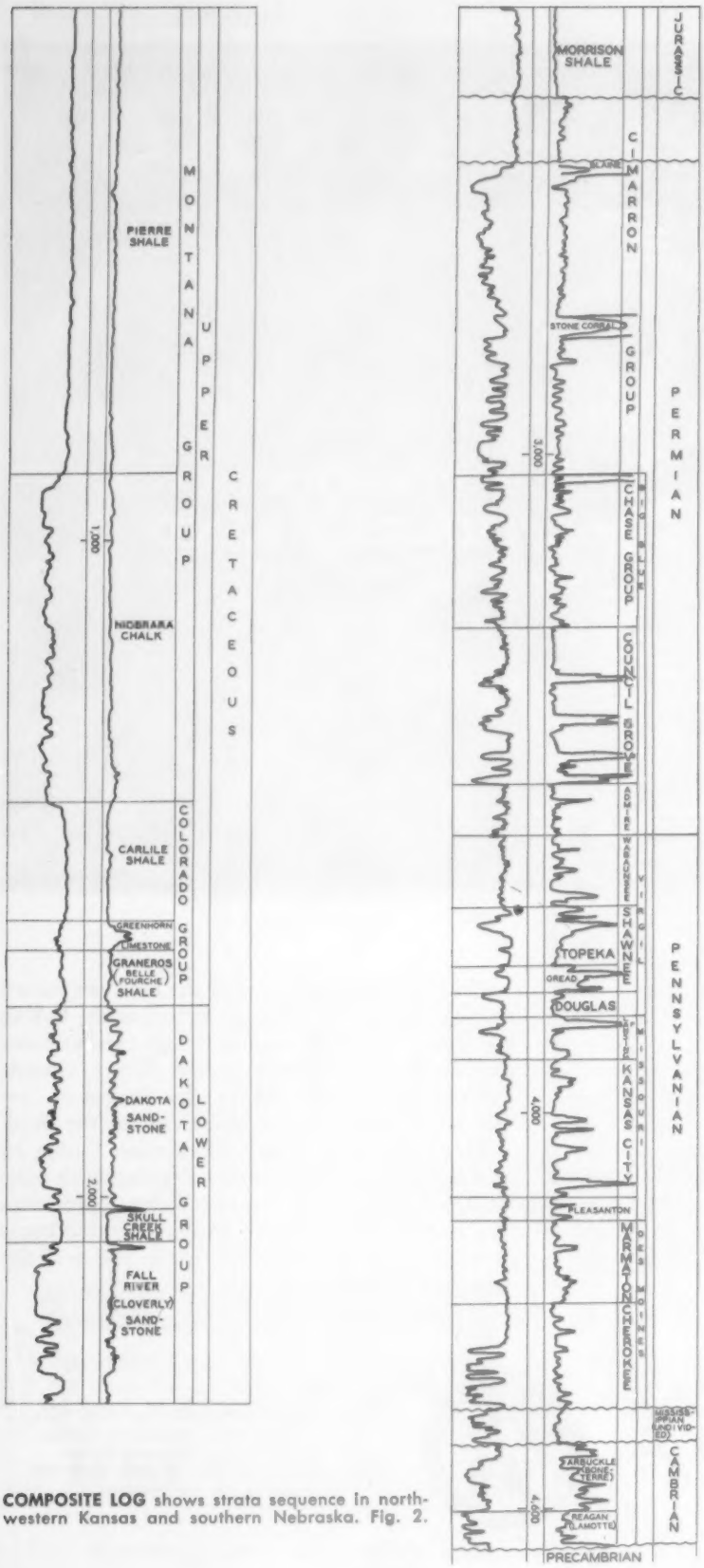
No other logging device in the field can record vertical changes in lithology as well as the FoRxo log. No other combination of logs can pinpoint pay sands as accurately as the Welex Guard-FoRxo, particularly where the formation resistivity is similar to the resistivity of the mud.

This is another Welex Production Guide to help the oil man make his own decision with confidence. Contact your nearest Welex representative and let the complete wireline service company give you the finest service in the field today. Call Welex and be sure.

WELEX, INC.

ORIGINATORS OF Welex JET PERFORATING

General Offices: 1400 East Berry, Fort Worth, Texas
Division offices in Denver, Houston, Los Angeles, Midland, New Orleans, Tulsa and Wichita.
District offices in every major oil center. Subsidiaries in Canada, Peru and Venezuela.



COMPOSITE LOG shows strata sequence in northwestern Kansas and southern Nebraska. Fig. 2.

play throughout northwest Kansas. The Cahoj and Reiher discoveries in the summer of 1959 have lured lease men to the extent that most open acreage has been taken in northwest Kansas and in southwest Nebraska, including Hitchcock, western Red Willow, Dundy, Chase and Hayes counties.

Regional Structure

The outstanding structural feature in this region is a major granite ridge which trends generally northwest-southeast through Red Willow and Frontier counties, Nebraska. This anticline is known as the Cambridge arch; viewed on a large scale, it is seen to be on the same major Mid-Continent structural trend as the Central Kansas uplift.

To the west of the Cambridge arch is a basin which shall be called the Southwest Nebraska-Northwest Kansas basin for the purposes of this paper. This basin is actually a north extension of the Dodge City basin. It is bounded on the west by the Las Animas arch which roughly parallels the Kansas-Colorado and the Nebraska-Colorado border and apparently terminates in Dundy or Chase County, Nebraska. Actually, the Las Animas arch is more a residual ridge or hinge line which was left after the collapse of the Denver basin to the west.

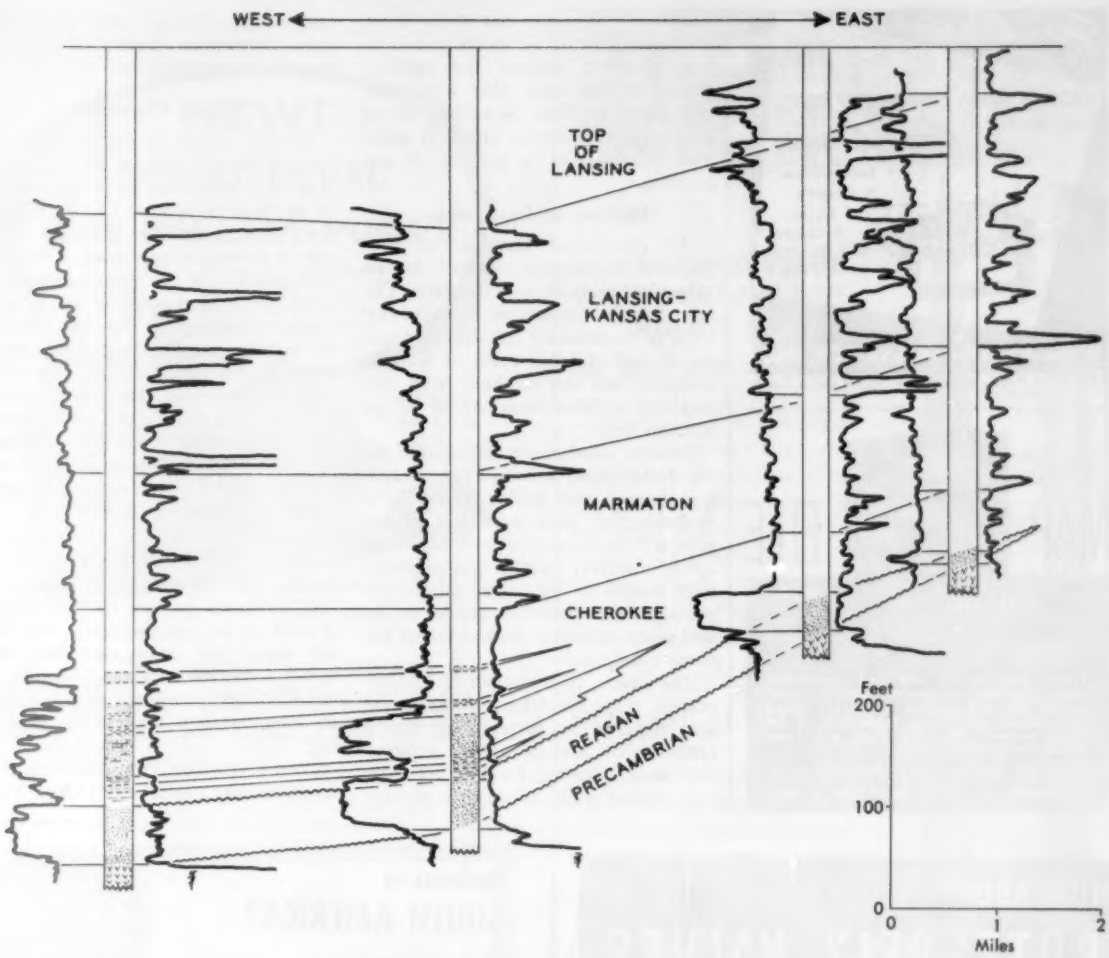
Beds dip sharply to the west in western Red Willow County off the west flank of the Cambridge arch. Regional dip in this basin is somewhat difficult to establish due to rather sparse subsurface control and the obviously anomalous position of much of these data. However, a relatively gentle west-northwest dip is evident on the top of the Lansing from northwest Dundy County through western Perkins County as the Southwest Nebraska-Northwest Kansas basin begins to plunge into the Denver basin.

Recent drilling by Skelly and other operators reveals what may become a northeast-southwest anticlinal trend of regional scope.

A relatively complete geological section is present in the central part of this basin. However, on the crest of the Cambridge arch, and from approximately the center of Hayes County north, the pre-Pennsylvanian horizons are absent. Fig. 2.

The Cretaceous Dakota sandstones, productive in the Denver basin to the north and west, have had some good oil shows in western Chase County but as yet have not been proved to be commercial.

The following is a list of horizons which are productive of oil in Kansas and which show every sign of being favorable in this area.



ELECTRIC LOGS depict east-west cross-section of new Pennsylvanian oil province in Kansas-Nebraska area. Fig. 3.

Along the Kansas-Nebraska line the shallowest horizon which is generally considered prospective is the Pennsylvanian Topeka limestone and its lower member, the Oread.

Below the Oread is the Lansing-Kansas City, a 250-270-ft. section of shale with limestone developments 2 to 15 ft. thick. Both the Oread and the Lansing are producing in the Reiher area of Hitchcock County, Nebraska.

The Marmaton section below the Kansas City very seldom has any porosity development, although some oil has been recovered from it in Northwest Kansas.

The basal Pennsylvanian or Cherokee sandstones, below the Marmaton, have excellent permeability and are productive in Llanos field of Sherman County, Kansas.

Unconformably underlying the Cherokee are the Mississippian cherts and limes, probably corresponding to the Osage and Gilmore City. Oil shows have been logged in the Mississippian but as yet no oil has been produced.

The Devonian, Silurian, and Ordovician are absent and below the Mississippian lies the Cambrian Arbuckle (Boneterre). The Arbuckle is a glauconitic dolomite with excellent porosity developments along its weathered edges. The lowest sediments of the section are represented by the Reagan (Lamotte) sandstone. The Reagan is a highly permeable sandstone which has had numerous oil shows but neither it nor the Arbuckle is yet productive in this immediate area.

The Precambrian basement is a white quartzite in the basin and a granite with considerable feldspar and biotite toward the arch. It is usually overlain by a weathered zone varying in thickness from a few feet to as much as 200 ft.

Types of Oil Traps

Practically every type of oil trap can be expected in this area, however, each formation has characteristics which are quite constant. The Lansing-Kansas City, which will probably ultimately account for the greatest number of fields, traps oil on anticlinal structures and to some extent on porosity pinchouts. Porosity, in fact, is one of the most important requirements for Lansing-Kansas City production and it seems that the lack of porosity rather than the lack of structure is often the condemning factor in unsuccessful tests. Fig. 3.

Cherokee sands trap oil in western Kansas on small anticlinal closures in combination with stratigraphic pinchouts or by pinchout or structure alone.

Mississippian, Arbuckle, and Reagan fields are usually caused by stratigraphic pinchouts, but are sometimes due to structure or a combination of both. Pinchout and truncation of Lower Pennsylvanian and pre-Pennsylvanian formations offer numerous possibilities of stratigraphic traps in this area.

Norton field of Norton County,

Geo-Logger
REDUCE WELL LOGGING COSTS!
with the PORTABLE Geo-Logger

• Temperature
• Gamma
• Electric
• Caliper
SALE OR LEASE
Phone FL 7-7378
WELL RECONNAISSANCE, INC.
7818 Brook Hollow Road • Box 1483 • Dallas, Texas

MAP FILE

#MT4
Easiest way to file and find confidential maps, tracings, blueprints. Quality metal cabinet file with locking doors. 112 tilting tubes handle 60" prints. Tubes indexed for quick location. Ideal for field and home offices. Shipped from stock.
Patent No. 1610368. Other Patents Pending.
SCOTT-RICE CO., 610 S. Main, Tulsa 3, Okla.

Kansas, on the south end of the Cambridge arch, is an Arbuckle and Reagan pinchout against the uplifted granite of the arch. One would expect fields in these formations to be primarily water-drive, although some may be aided by a gas cap or gas solution.

Methods of Exploration

All established methods of geophysical exploration should be of value in this hard rock country. The fact that the formations and types of traps to be expected are almost identical to well-explored parts of Kansas, indicates that any methods used successfully in those areas should be applicable here.

Seismic surveys are responsible for the better discoveries so far, including Warner and Reiher fields. It is probable that most structures in this area will be associated with basement uplift, therefore gravity and magnetic data should be of value. Subsurface geology will probably prove to be best when sufficient control points become available.

The fact that numerous stratigraphic traps are taking shape in the area requires one to point out that a considerable part of future exploration must take the form of exploratory wildcat wells. Subsurface geology and wildcat drilling is still about the only dependable method for stratigraphic-trap exploration.

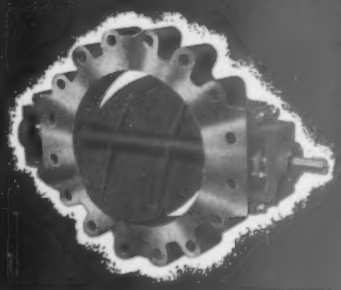
Drilling Conditions

Drilling depths to the Precambrian range from 3,200 ft. on the top of the arch to 5,500 ft. in the deepest parts of the basin in western Dundy, Chase, and Perkins counties. Drilling time, out of surface, ranges from 6 days to perhaps 15 or 18 days, depending upon the depth, amount of testing, etc. Costs, including an average amount of testing, logging, etc., will range from approximately $18,000 to $25,000. A few wells have experienced lost circulation in the Dakota sands and rarely, in the Arbuckle and Granite wash. Reasonable precautions, including proper mud and pump pressures, will minimize these risks.

Acreage Holdings

The bulk of the lease acreage in the Nebraska portion of this region is held by majors. Generally, the oldest leases will expire in 1965 and most of the rest in 1966. Majors represented and the approximate rank of their holdings include the following:

Skelly Oil Co.; Pan American Petroleum Corp.; Superior Oil Co.; Brit-

HOW ABOUT
BUTTERFLY VALVES
FOR MANUAL and POWER CONTROL

FISHER-CONTINENTAL Butterfly Valves fit the specifications of a vast majority of applications. They're low cost—more compact than expensive, complex valve installations. And they're easier to operate and service, too.
FISHER-CONTINENTAL GIVES YOU FULL FREEDOM OF CHOICE
For gas, vapor, liquid or semi-solid control problems specify Fisher-Continental Butterfly Valves—any size . . . any metal or alloy . . . any temperature . . . any fluid . . . any pressure . . . any condition . . . any operator, manual or power.

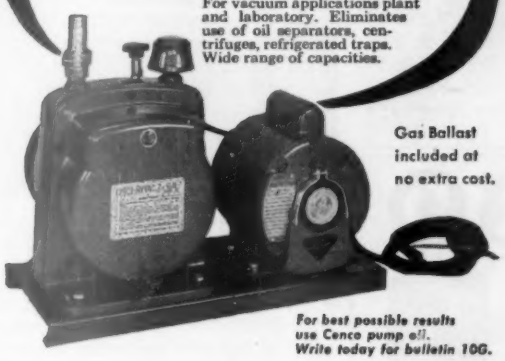
For complete details about Fisher-Continental Butterfly Valves send for free literature.
FISHER GOVERNOR COMPANY
Marshalltown, Iowa/Woodstock, Ontario/London, England
Direct Inquiries To:
CONTINENTAL EQUIPMENT CO. DIVISION, CORAOPOLIS, PENNSYLVANIA
FISHER Controls
SINCE 1880

business in
SOUTH AMERICA?
fly
CANADIAN PACIFIC
All flights to Mexico City are your link to Canadian Pacific's famous South American service. Canadian Pacific is You'll enjoy the matchless hospitality of Canadian Pacific's your finest flight to Lima, Santiago and Buenos Aires.

International service. Stretch-out arm chair seats, friendly atmosphere and relaxing, air-conditioned comfort. Canadian Pacific service continues with exquisite vintage wines and superb continental meals. Be one of the millions who know that Canadian Pacific's hospitality cannot be matched throughout the world.
Plan your business travel for pleasure . . . from Mexico City it's non-stop to Lima, Santiago and Buenos Aires.
See your Travel Agent or any Canadian Pacific office.
Canadian Pacific
AIRLINES
WINGS OF THE WORLD'S GREATEST TRAVEL SYSTEM

NEW!
CENCO® HYVAC
GAS BALLAST PUMPS

For vacuum applications plant and laboratory. Eliminates use of oil separators, centrifuges, refrigerated traps. Wide range of capacities.



Gas Ballast included at no extra cost.

For best possible results use Cenco pump oil. Write today for bulletin 10G.

cenco®

REFINERY SUPPLY CO.
A Subsidiary of Central Scientific Co.
621 East 4th Street • Tulsa 20, Oklahoma
Branches and Warehouses—Mountainside, N. J. Boston • Birmingham • Santa Clara • Los Angeles • Tulsa Houston • Toronto • Montreal • Vancouver • Ottawa

Talk over your oil financing with a Mercantile oil officer. His knowledge and experience can save you time and money.

•

Call RI 1-4181 or write
OIL and GAS DEPARTMENT

MERCANTILE NATIONAL BANK
DALLAS TEXAS

THOMPSON
SAND RESISTANT OIL WELL PUMPS

TRAVELING PLUNGER ROD TYPE BOTTOM HOLD-DOWN PUMP STANDARD SIZE

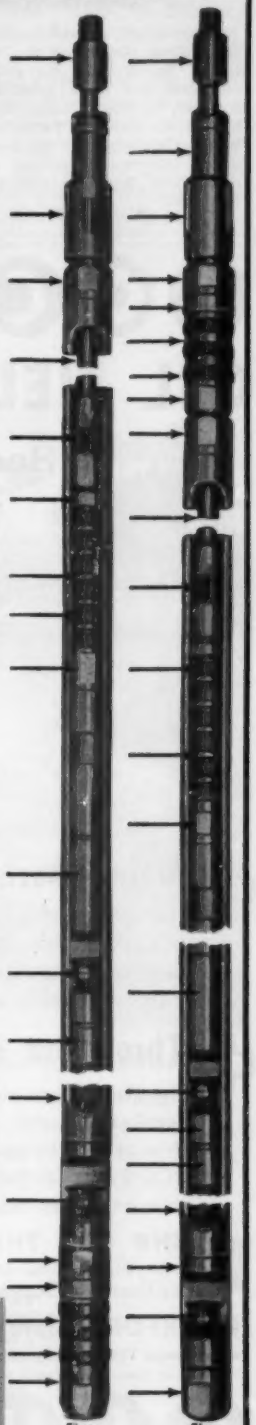
Figs. 400P, 600P, 700P, 800P

Single or double, self-aligning, combination cup and plunger or all-metal traveling plunger type, pumps made in four sizes: regular 1½", 1⅝" oversize, 2" regular and 2⅛" oversize bore. These pumps seat in API seating device. In very sandy wells, or when tubing is out, we recommend our SAND HOUSING MECHANICAL SEATING SHOE, which prevents sanding in of pumps as sand can be pumped and the pump pulled at any time by our sand flushing arrangement.

TOP HOLD DOWN INSERT ROD PUMP

Standard Size, Figs. 400T, 500T

Self-aligning double plunger insert pumps. Made in three types: combination cup and single plunger; combination cup and double self-aligning type; and metal-to-metal double plunger self-aligning type. All are equipped with Regular or Extra Long Alloy Plungers, ground individually to fit the barrels, assuring longer life on both pump and surface equipment.



Figs. 400P, 600P, 700P, 800P

Figs. 400T 500T

THOMPSON PUMP COMPANY
OKMULGEE, OKLA.
DRAWER 591

ish American Oil Producing Co.; Texaco, Inc.; Amerada Petroleum Corp.; Ohio Oil Co.; Phillips Petroleum Co.; Magnolia Petroleum Co.; Cities Service Oil Co.; Frontier Oil & Refining Co.; Gulf Oil Corp.

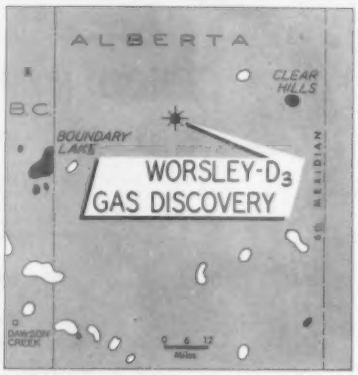
Acknowledgment

Appreciation is hereby expressed to Dr. E. C. Reed, director of the Nebraska Geological Survey, and his staff, who have compiled, and made generously available, a wealth of basic geologic data in Nebraska. R. F. Svoboda, formerly of the Nebraska Geological Survey, has also worked up a considerable portion of the basic data which the State makes available on this area.

Alberta wildcat hits Devonian pay

DEVONIAN D3 reef gas production was tapped at a Shell Oil Co. of Canada, Ltd., wildcat in northwestern Alberta. The new strike is Shell 14-19-87-7 Worsley on the Clear Hills Provincial Reservation.

The well flowed up to 8 M.M.c.f.d. on tests of 162-ft. interval in the Peace River Fringing reef at 7,255-95 ft., 7,352-82 ft., and 7,205-66 ft. Full value of this strike won't be determined until production tests are made. This is the first big reef strike of 1959 in Alberta. Its remote location from other production of any kind makes it one of the most important strikes in some time for this portion of Alberta.



ALBERTA's most important gas strike of the year is at Worsley in the Clear Hills region.

Confirmation near for important Anadarko hit

The Anadarko basin's most important discovery of the year, and for that matter, many years, is about to be confirmed. Magnolia Petroleum Co. found gas in the Hunton Siluro-Devonian at its second well in new North Custer City field, Custer County, western Oklahoma.

The test was made at 14,686-14,751 ft., making 2,310 M.c.f.d. This second-indicated producer in this new pool will be a great boon to the important discovery well which shattered several Anadarko records a few months ago.

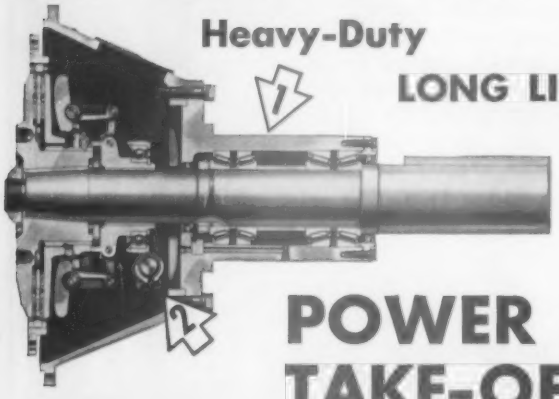
Another hit . . . Gulf Oil Corp.'s 1 Burgtorf in SE NW 6-13n-15w is flowing 1,800 M.c.f.d. with 4 bbl. fluid in 24 hours on ½-in. choke from perforations at 13,365-13,425 ft. Successful completion of this small gas discovery would open Custer County's second producing area.

Remote test set for East New Mexico

Remote exploration is slated in eastern New Mexico at Bert Thompson 1 Tucumcari National Bank in C SE SE 20-8n-22e, central Guadalupe County.

This 6,500-ft. granite test will be drilled by Frank Frawley Drilling Co. 3 miles southeast of the town of Santa Rosa. Location is on the west side of the Tucumcari embayment.

ROCKFORD
OIL FIELD TYPE
Heavy-Duty
LONG LIFE
POWER TAKE-OFF



Small Spring Loaded
Heavy Duty Spring Loaded
Oil or Dry Multiple Disc
Heavy Duty Over Center
Power Take-Offs
Speed Reducers

1 Main Bearings Run in Oil Bath
The special, large Timken main bearings in the new ROCKFORD POWER TAKE-OFF are adjusted when assembled at the factory. They require no further adjustment—and run in a reservoir of lubricating oil.

2 Throw-Out Bearing Oiled for Life
The clutch throw-out bearing is lubricated for life and requires no further attention. Cut down on the servicing time needed by *your* equipment by specifying this new ROCKFORD Oil Field Type POWER TAKE OFF and save time and labor costs.

SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER
1305 Eighteenth Ave., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

Tests show more pay in Alberta's Lookout Butte

The British American Oil Co., Ltd., operator of an exploratory test south of the fabulous Pincher Creek field in southwestern Alberta, has to date found a total of 370 ft. of gas-bearing Mississippian limestone.

It will be recalled that the venture, situated in the Lookout Butte district, gassed at maximum rate of 7 M.M.c.f.d. during the initial test conducted in the discovery horizon. Since that time four other evaluation tests have been conducted, with the latest covering 150 ft. of zone, bottomed 474 ft. below the top of the Mississippian. Maximum flow rate during the 10½ hours tool was open, measured out at 2,740 M.c.f.d. However, the entire section has not been as porous as the second test flowed at rate of 2,588 M.c.f.d. while covering 50 ft. of section; the third gave maximum rate of 800 M.c.f.d. while the fourth, of an additional 50 ft., gave maximum rate of 300 M.c.f.d.

This well, BA 11-31-1-27 Lookout Butte, is being drilled on LSD 11, 31-1-27w4. It is 10½ miles south of the closest gas producer in Pincher Creek field, 5½ miles north of the Montana-Alberta border and 14 miles southeast of the closest current driller in the Waterton Park region.

The Mississippian discovery horizon came in around the 11,995-ft. level and crew of the Brinkerhoff Drilling Co., Ltd.'s rig working on the hole was attempting to free stuck drill pipe at total depth of 12,469 ft. at last report.

Kansas' Eubank sets fast exploratory pace

Southwest Kansas' Eubank field, an inside Hugoton producing giant, continues its growth. Three new wells in Grant and Haskell counties add more zest to the fast-moving play in this section of the state.

In the area 2 miles west of North Eubank field, W. C. Jackson and Sullivan et al. 1 Pollyanna, C SE SE 36-27s-35w, 15 miles northeast of Ulysses, Grant County, recovered 900 ft. of free oil on drill-stem test in the lower Kansas City Pennsylvanian at 4,129-42 ft. Drilling continues below 4,610 ft. to the 5,400-ft. Mississippian goal which is the pay in the field.

United Producing Co. 1 Hickman, Grant County wildcat, is the county's first oil well. The well made 22 bbl. of oil in 18 hours from perforations in Mississippian Chester at 5,466-80 ft. Location is in NE SW 23-30s-35w.

New Morrow Pennsylvanian oil production is reported in Haskell County at W. C. McBride, Inc., 1 Eubank. It pumped 87 bbl. per day from perforations at 5,337½-42½ ft. Location is 3¾ miles northwest of Koenig field, 3 miles east of Eubank field in C SE NE 23-28s-34w.

Geologists tour Ouachitas

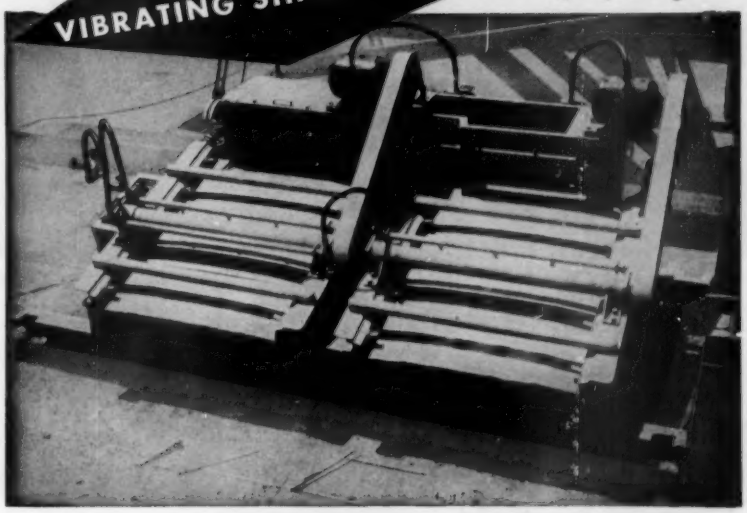
The Ouachita Mountains of southeastern Oklahoma, the southern limits of the long east-west McAlester-Arkansas River Valley basin, will be toured and studied by geologists this September 18.

The Ardmore Geological Society will sponsor a 2-day trip through the mountains, led by Dr. Lewis M. Cline of the University of Wisconsin. With interest in this area running high at the moment, a large attendance is expected. T. A. Hendricks of the Fuels Branch of the USGS in Denver, formerly of Pan American Petroleum Corp., will be the main speaker at a dinner in McAlester's Aldridge Hotel Friday evening, September 18.

Others present who will contribute to the discussion of this promising new oil and gas province are: Hugh Miser of the USGS, William Hilseweck of Dallas, William E. Ham of

For the VINEGARROON They Chose a

Thompson
VIBRATING SHALE SHAKER



Thompson . . . Perfect for Offshore Work!

On offshore rigs the reclamation of mud is vitally important and the separation of shale and abrasives from drilling muds means a more effective, time and money saving drilling job. Barnwell Offshore, Inc. chose Thompson for their new offshore rig, the VINEGARROON, because it was field proven, will give them clean mud and make tools last longer, with a minimum of re-tooling and restoration of mud solution.

A Thompson Separator is your surest bet onshore . . . offshore . . . for shallow, medium and deep wells. The dependable Sample Machine works simultaneously with the separator, giving a foot-by-foot mud analysis with specimens. Write for Folder.

THOMPSON TOOL CO.
IOWA PARK, TEXAS

SOLD ONLY THROUGH SUPPLY STORES

the Oklahoma Geological Survey, Bert Scull of Sun Oil Co., and Buck Miller of Gulf Oil Corp.

Reservations may be made by writing to the Ouachita Mountain Field Conference, c/o Pure Oil Co., Box 750, Ardmore, Okla.

Strike confirms Kansas' Wilhelm

QUICK FOLLOWUP to the Wilhelm field Pennsylvanian discovery in Rawlins County, northwestern Kansas, netted a good confirmation strike. Skelly Oil Co. 1 Wicke, SE SE SE 17-1s-32w, pumped 303 bbl. of oil daily from Lansing-Kansas City perforations at 3,958-60 ft.

Just 2 weeks ago, Skelly opened Wilhelm field at 1 Meyer in SE SE NW 20-1s-32 for 258 bbl. per day from Lansing-Kansas City perforations at 4,061-70 ft. Both wells are in the highly active northwest Kansas-southwest Nebraska Cambridge arch-Las Animas arch play.

Sherman County . . . Reaves Drilling Co. has contract for a new wildcat 14½ miles west of Goodland in Sherman County. E. J. Athens 1 Zeibig, C SW SW 10-8s-42w, will add to the drilling furor in this section of Kansas. Location is 30 miles southwest of Llanos field, mother of this Kansas play. It is also 8 miles east of tight hole being drilled by C. C. Hammer at 1 Davis in NW SW 6-9s-42w, Kit Carson County, Colorado. That well is due to hit Mississippian at about 5,000 ft.

The confirmation well to a recently opened Pennsylvanian oil pool in northwestern Kansas is a success. Phillips Petroleum Co. completed the 1 Reeves-A in C SE SE 23-4s-34w, Rawlins County, for a pump gage of 169 bbl. of oil and 14 bbl. of water daily.

Production is from Marmaton perforations at 4,428-36 ft. This is the west offset and confirmation to the discovery well. That strike, completed earlier this year, was the 1 Bowles in C SW SW 24-4s-34w. It made 115 bbl. of oil per day on pump from Marmaton.

Stepout flows in Ohio's Knox County

In Ohio in east-central Harrison Township, Knox County, a stepout by Hoosier Oil & Gas Corp. flowed at the rate of 400 bbl. oil with 657 M.c.f. in a 24-hour test after fracture.

The operators reported the Clinton at 2,739-68 ft. on 1 R. D. Barcus, Section 12, which had a fair showing natural.

In Reading Township, Perry County, Wiser Oil Co. completed an extension to the South Somerset pool.

Its 2 T. P. George made 200 bbl. oil with 325 M.c.f. in a 24-hour test 1 month after fracture. The Clinton was logged at 2,949-77 ft. with 2 bbl. oil and a showing of gas natural.

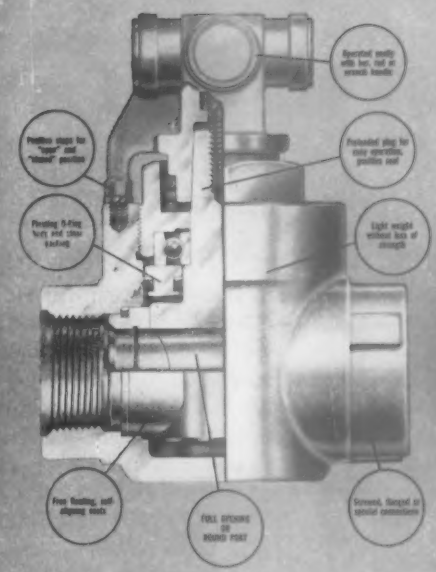
Significant Washington well drills ahead

In Washington Shell Oil Co. 1 Sturdevant is rapidly making hole as this critical test heads for its Eocene objectives in the Chehalis basin.

The well was spudded August 8. Objectives are Upper Eocene Cowlitz and McIntosh sands. Sands within this section tested wet in the Pleasant Valley Oil & Gas Corp. 1 Guenther (TD 8,015 ft., 1958), located about 5 miles to the northwest, but revealed excellent porosity and permeability in sands ranging from 50-150 ft. thick.

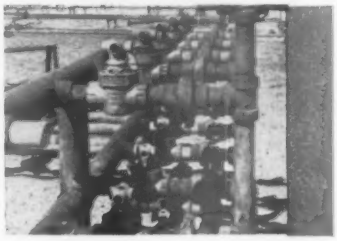
Most operators feel that all that is

GRAHAM...



Graham Non-Lubricated Plug Valves are available with threaded, flanged or special end connections; in sizes 1" through 4" and working pressures to 10,000 psi.

the PLUG VALVE that NEVER NEEDS LUBRICATION



The cost of lubrication, or worse, the cost of failure to lubricate, are two problems you won't have when you use Graham Non-Lubricated Plug Valves on drilling rig lines, Christmas tree wings, flow lines, headers, manifolds, in processing plants and many oil and gas transmission operations.

Seats in the Graham Valve are free-floating . . . self-aligning . . . micro-fitted for bubble tight sealing. An extreme minimum of plug—body contact and bronze or ball thrust bearing hold down arrangement of plug assures optimum operating ease under full rated pressure.

Before specifying any valves for new installations or replacement, write for Graham Valve Catalog 581-GP.

TEXSTEAM Corporation

320 Hughes St. • P. O. Box 9127 • Houston 11, Texas • Phone WA 6-0853

GARRETT OILFIELD AUTOMATION

...IS THIS SIMPLE

Complicated electronics is fascinating in the laboratory but has no place on an oil lease. That is why Garrett, with years of oilfield know-how, developed a simplified and highly standardized system of automation for the entire well complex. Tested and proved in the field, Garrett equipment, which utilizes commercially available components, is now obtainable from off-the-shelf stocks.

Field units can be operated or restored to service by any pumper without specialized electrical training. The system uses standard 110 volt alternating current, with plug-in type replaceable elements.

Garrett automation covers every step of production control: wellhead flow, well test programming, LACT, recording, communications . . . plus home office reports and machine records.

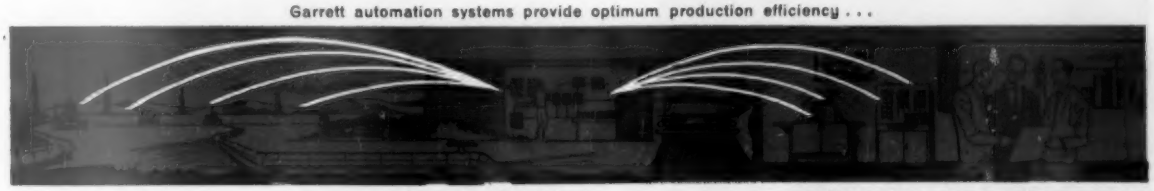
Completely compatible with existing equipment and control systems, Garrett offers the additional advantage of building block design. You can start with the simplest well control system — then add further automation or expand as needs arise. When production justifies, the automation of the entire well complex can be completed without changing existing portions already automated.

Let a Garrett automation engineer consult with you on your next production automation program. He will explain how Garrett offers complete turn-key installations . . . call or write today.

USI Garrett Oil Tools

Division of U. S. industries, Inc. P. O. Box 2427, Longview, Texas

Garrett automation systems provide optimum production efficiency . . .

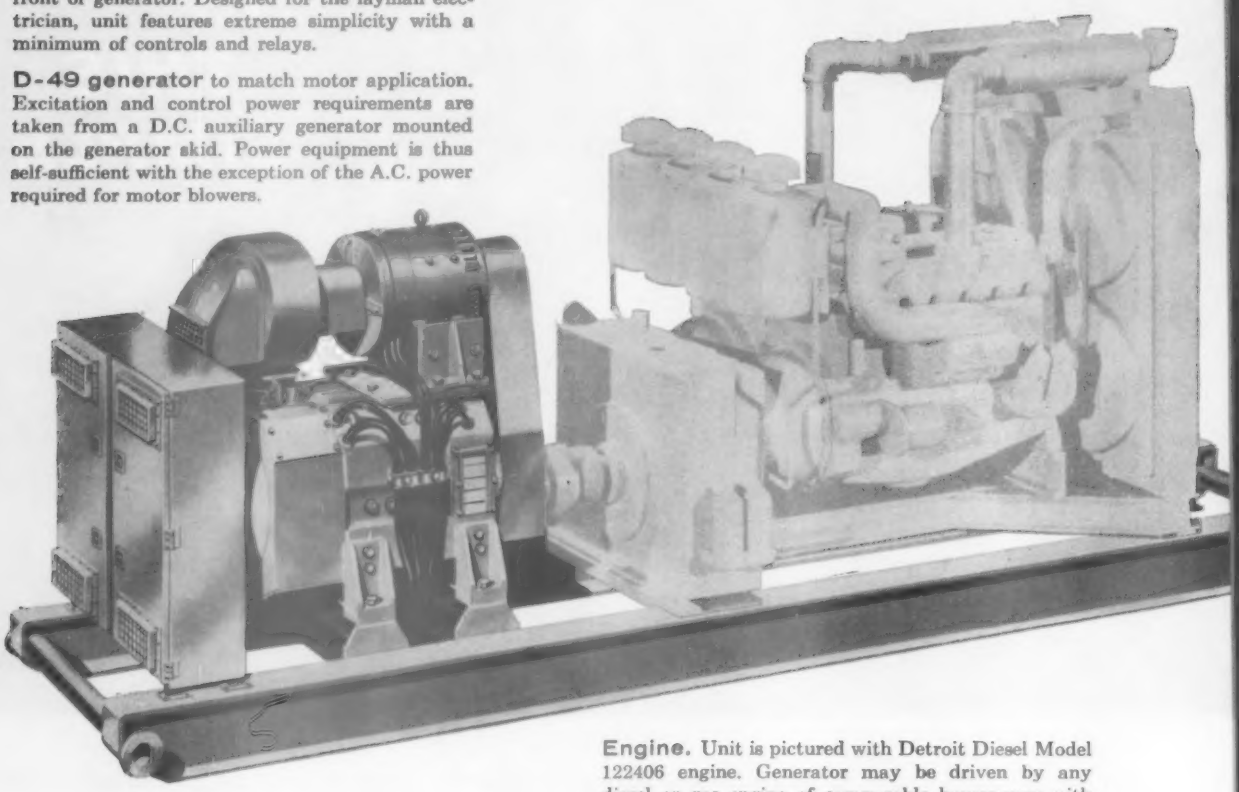


. . . from wellhead **. . . to field station** **. . . to home office records unit.**

NEW ECONOMY FOR

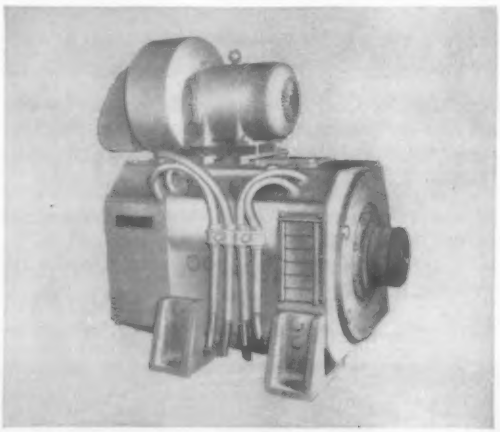
Motor control cabinet is mounted on skid in front of generator. Designed for the layman electrician, unit features extreme simplicity with a minimum of controls and relays.

D-49 generator to match motor application. Excitation and control power requirements are taken from a D.C. auxiliary generator mounted on the generator skid. Power equipment is thus self-sufficient with the exception of the A.C. power required for motor blowers.



Engine. Unit is pictured with Detroit Diesel Model 122406 engine. Generator may be driven by any diesel or gas engine of comparable horsepower with a shaft speed of 1200 RPM.

Driller's control. Control panel can be located most convenient to total operation. Panel is simple, easy-to-operate. Driller has complete control of drawworks, rotary and mud pumps from one location.



Drive motors. Electro-Motive D-49M direct current drive motors capable of 700 hp. Motors provide smooth and rapid acceleration of loads with positive control of speed and torque.

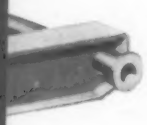
MEDIUM-DEPTH DRILLING

Announcing the Electro-Motive SR-5 Diesel-electric Power Unit

Electro-Motive pioneered development of integrated Diesel-electric power for deep well drilling. The tested dependability of this larger equipment has been retained in the design of this new unit for medium-depth drilling. In addition, the SR-5 features many special cost-saving advantages.

Simplified design

Unit is set up or taken down with simple electrical connections. No special instructions or electrical knowledge required. Controls are easy-to-learn, accurate and provide complete power flexibility. Generator and drive motors are standardized, permitting parts interchange. Maintenance is extremely low.



Fast rig-up and moving

Skid-mounted components are easily portable, save on moving time and costs. Flexible electrical cables speed set-up and take-down time—permit components to be arranged to suit location. No time-consuming alignment required.

Power where needed

The SR-5 provides complete flexible control. Through its simple control panel, power is apportioned to match the changing demands of each operation. Thus, the driller can balance operations according to conditions, maintain a high drilling rate.

Adaptable

A number of arrangements are available to suit the needs of varying applications. Basic set is a two generator, two drive-motor unit. With addition of another generator skid and two drive motors, unit can drill in excess of 12,000 feet, or, as limited by engine horsepower. Controls are also designed for this expansion.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS **In Canada:** General Motors Diesel Limited, London, Ontario

Petroleum sales offices: Houston and Los Angeles

Authorized dealers: Hunt Tool Co., Houston, Texas; Kennedy Marine Engine and Equipment Co., Biloxi, Miss.; United Power, Inc., Shreveport, La.

needed for a discovery in the basin is adequate structural closure. Shell's test represents the culmination of several years' detailed surface work and extensive seismic shooting and could just be the straw that breaks the camel's back.

Shell is currently grading location for a second wildcat about 6 miles southwest of the 1 Sturdevant.

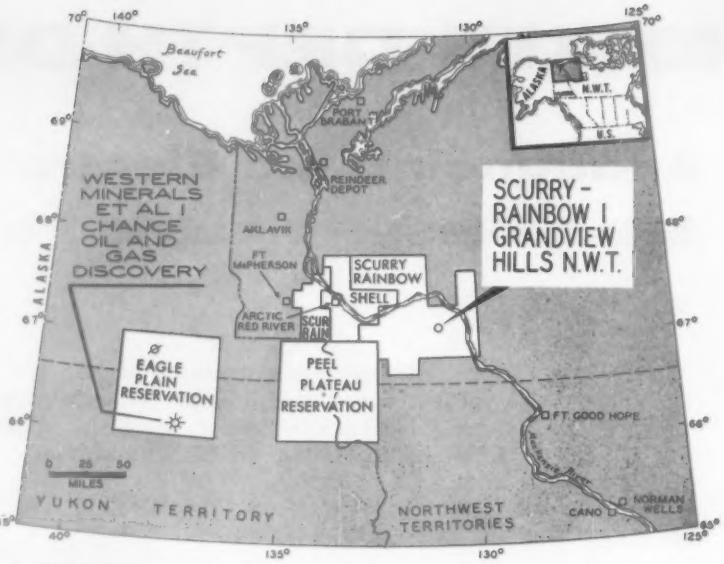
Oregon, Washington exploration flares

A rundown of active wells in the Pacific Northwest shows that half a dozen locations are being worked in Washington and Oregon.

Northwest Oil Report of Portland reports that Tideland Oil & Gas Corp. 1 Carlisle-Estate, C SE¼ 23-20n-12w, Ocean City area, Grays Harbor County, Washington, is at depth 3,592 ft. The operator will run casing and perforate possible pay zones at 3,330-3,541 ft. Recovery on test at 3,392-3,541 ft. was 720 ft. of fluid, including 700 ft. gas-cut mud and 20 ft. clean, gassy oil.

Tideland reportedly will start another well in 15-18n-12w soon.

In Washington's Chehalis basin, Lewis County, Shell Oil Co. 1 Sturdevant, 27-12n-2w, is drilling at 8,085 ft. Shell is grading location for another well in 15-11n-2w. This one will be 6 miles southwest of the Sturdevant. It is the second location of a reported three or four-well program for the basin.



THE FIRST WILDCAT within the Arctic Circle in Canada's lower Mackenzie River basin will be drilled by Scurry-Rainbow Oil, Ltd., a Canadian independent. The operator is moving drilling equipment down the Mackenzie River in the Northwest Territories to initiate Canada's most northerly drilling venture. The drilling location lies 200 miles northeast of the Eagle Plains gas-oil discovery of 2 weeks ago.

Wn-Cal Exploration Co., Inc., is deepening Utah Consolidated 22-1 Swanson in the Ocean City area. Total depth is 438 ft. Plans call for a deepening job to 5,000 ft. The well is

Protect Metals Against Highly Corrosive Conditions...

IN ANY CLIMATE

MARKAL "D-A" COATINGS afford a lasting protection to metals from the ravages of weather and chemical corrosion, salt spray, sulfur fumes, hot acids . . . at temperatures up to 600° F. Also protects against galvanic corrosion between dissimilar metals. Easy to apply with brush or spray. Ideal for inside or outside use.

COMPLETE LINE OF MARKAL COATINGS for all kinds of extreme industrial applications . . . widely used, economical, thoroughly proved in service, dependable. Write on your letterhead for complete literature, indicate the nature of your requirements.

Markal COMPANY

3107 West Carroll Avenue • Chicago 12, Illinois

INCREASE PROFITS WITH REDA Submergible PUMPS

REDA GIVES YOU THESE COST SAVING FEATURES AND DOES THE JOB BETTER!

- **Lower cost for installation, operation and maintenance.**
- **250 to 18,000 BPD capacities**
- **Depths to 10,000 ft.**
- **Corrosion-resistant construction**
- **Long life — dependable service**
- **A complete line to meet pumping requirements**

and

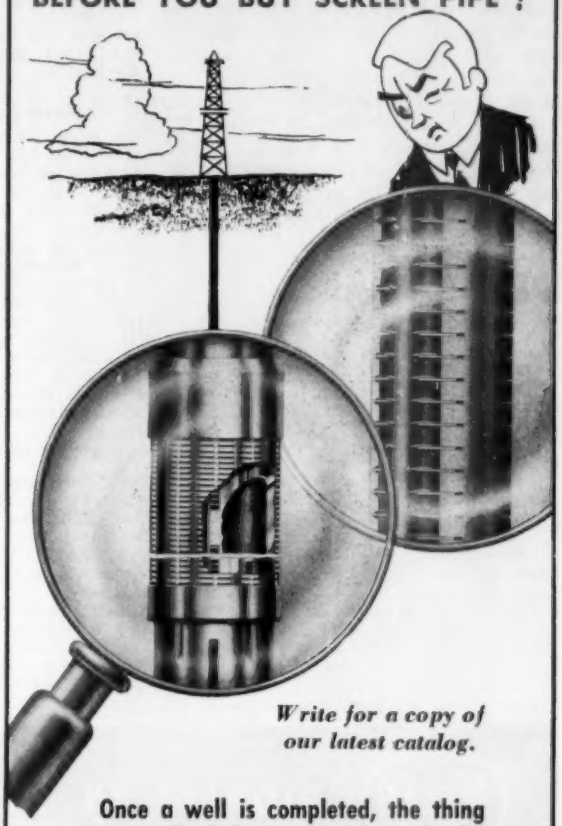
INVESTMENT COST IS FAR LOWER WHEN YOU CHOOSE REDA FOR YOUR PUMPING NEEDS.

Write or call for more information. Reda engineers will be pleased to assist and help plan your operations.

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP COMPANY
BARTLESVILLE, OKLAHOMA
Manufacturers of submergible motors and pumps for over 35 years — for oil, brine and water wells, gasoline and jet fuel —

Take A Good Look...
BEFORE YOU BUY SCREEN PIPE !



Write for a copy of our latest catalog.

Once a well is completed, the thing next to the hole in importance is the selection of the best Screen Pipe available. Here are the facts about EMSCO Screen Pipe.

EMSCO Wire Wrapped Screen with vertical slots provides 50% to 60% more opening per foot than conventionally drilled holes. It retains more tensile strength than drilled pipe.

EMSCO Slotted Screen Pipe retains up to 85% of the original collapsing strength of the pipe. It is smooth, facilitating setting and pulling. It can be reasonably spudded or rotated without fear of damage. Internal "V" slots promote drainage, retard clogging.

EMSCO
SCREEN PIPE COMPANY
P. O. Box 14446 • Phone JA 6-2609
3 Ricks Rd. • Houston 21, Texas

EXPORT REPRESENTATIVE: Val R. Wittich, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

about 1 mile south of the 1 Medina discovery well, Washington's sole producer.

In Oregon . . . Ross R. Mitchell and Associates 1 Bliven, NEc 15-8s-5w, Dallas area, Polk County, was spudded August 8. It is drilling below 350 ft. Plans call for a 1,000-ft. push to the Upper Eocene.

In the Nashville area of Lincoln County, Oregon Oil & Gas Co. 1 Roberts in NE¼ 25-10s-8w, is drilling below 1,000 ft. on its way to 2,000 ft. in the Middle Eocene Burpee (Tyee) formation.

Discovery wells

CALIFORNIA

Glenn County: General Petroleum Corp. 54-10 Moda Unit, NE SE 10-22n-2w, 5,800 M.c.f.d., 56/64-in. choke, perfs. 1,710-35 ft., TD 5,898 ft. (New gas field Midway between South Dome and Ord Ben gas fields in northern California.)

Sacramento County: Texaco, Inc. 2 Wilson-McCall, NW NW 1-4n-4e, 83 M.c.f.d., ⅛-in. choke, perfs. 2,918-2,928 ft., TD 5,000 ft. (New shallow gas pool discovery in the Walnut Grove area of River Island gas field.)

Santa Barbara County: Martin Bertagnole 1 Teapot Fox, SE NW 31-5n-32w, 20 BOPD, 18° gravity, 12% cut, perfs. 2,200-34 ft., 2,325-47 ft., 2,420-70 ft., 2,816-36 ft., 2,896-2,918 ft. and 2,942-54 ft., TD 3,050 ft. (New field discovery in Gaviota area.)

WESTERN CANADA

Saskatchewan: Ceepee 10-14 Cortus, LSD 10, 14-31-19w3. Viking oil discovery. TD 2,380 ft.

Tidewater 6-25 Kenosee Crown, LSD 6, 25-10-3w2. Mississippian oil discovery. TD 3,987 ft.

Mobil et al. X3-5 Southeast Midway, LSD 3, 5-14-19w3. Shaunavon gas discovery. TD 3,711 ft.

NORTH LOUISIANA

Franklin Parish: Munoco Co. 1 Browder, C N½ SE NE 18-14n-7e, 3¾ miles northwest of Winnsboro. IP 2 M.M. c.f.d., ¼-in., 30 BC per M.M.c.f.d., 73°, TP 1,500 psi., perf. 4,606-11 ft., Tuscaloosa. TD 4,772 ft. Old hole cleaned out and perforated. Discovery well of Winnsboro field.

Tensas Parish: Jett Drilling Co., Inc., 2-D Fisher, C SE SW 25-13n-10e, 2¾ miles southeast of Newlight. IP 75,000 M.c.f.d., calculated open flow, 57 BC per M.M.c.f., shut-in TP 2,898 psi., perf. 7,915-25 ft., Tuscaloosa. TD 8,025 ft. New-field discovery 4 miles southeast of Newlight field.

TEXAS GULF COAST

DeWitt County: Argo Oil Corp. 1 Thomas Cook, W. W. Arrington Sur., A-51. AOF 5,700 M.c.f.d., GLR 45.1 M.c.f. per barrel, 54.4°, shut-in TP 3,365 psi., perf. 9,800-22 ft. and 9,826-28 ft., lower Wilcox. TD 10,620 ft. New-field discovery.

Fort Bend County: Grover J. Geiselman 1 J. R. Farmer, Joel Lee Sur., A-278, 3½ miles south of Needville. IP 162.01 BOPD, ⅛-in., 38°, GOR 660 cu. ft. per barrel, TP 1,075 psi., perf. 7,002-06 ft., Frio. TD 7,256 ft. New-reservoir discovery ¾ mile south of Needville field.

Matagorda County: North Central Oil Corp. 1 Albert Schwenn, Lot 88, Blk. B, Pearl P. Smith Sur. 4, A-562, 1 mile west of Blessing. AOF 4,500 M.c.f.d., GLR 28.6 M.c.f. per barrel, 62°, shut-in TP 2,523 psi., perf. 6,944-70 ft., Frio. TD 10,990 ft. New-reservoir discovery 1 mile northwest of Blessing field.

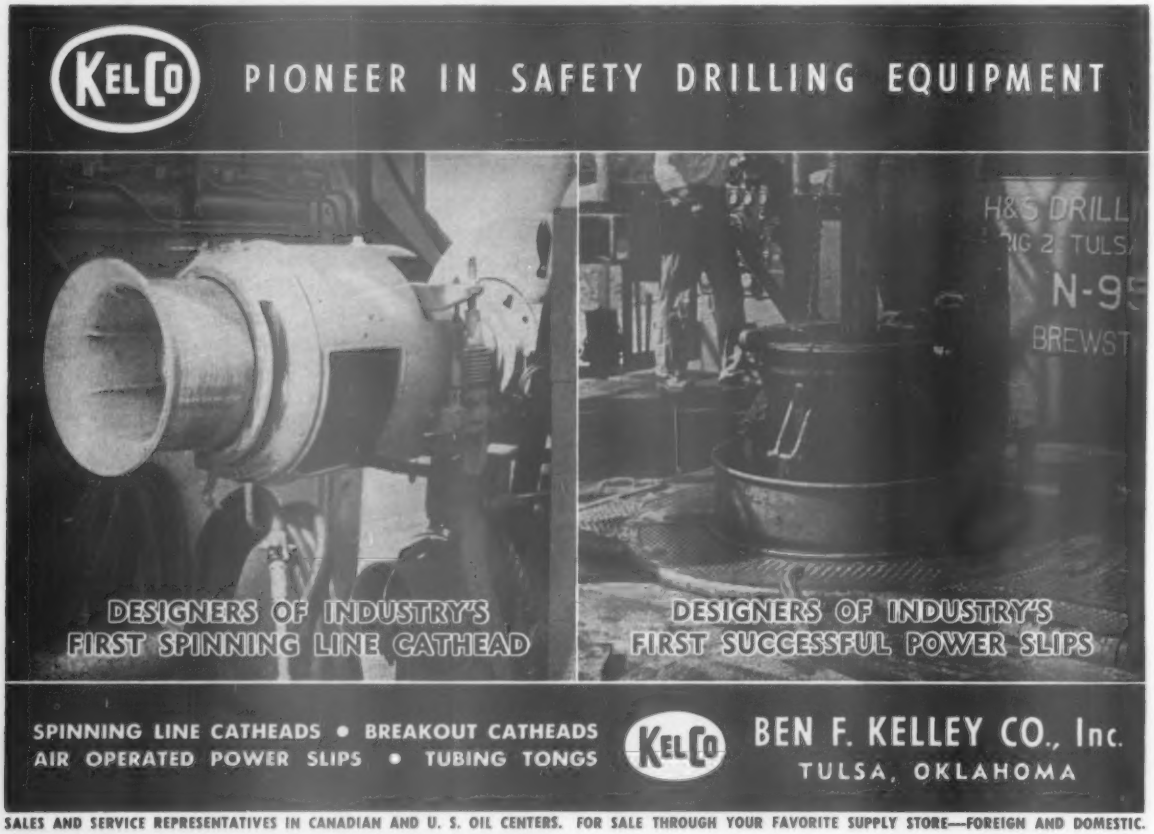
Refugio County: Quintana Petroleum Corp. 13 Clement Heard, Maria J. Ximenes Sur., A-324, 8 miles northeast of Refugio. IP 104 BOPD, 9/64-in., 23.5°, GOR 245 cu. ft. per barrel, TP 30 psi., perf. 4,388-92 ft., Massive Greta sand. TD 6,000 ft. New pay in Tom O'Connor field.

San Jacinto County: Texas Gas Exploration Co. 1 Ogletree, Uriah Gibson Sur., A-133, 2 miles southwest of Shepherd AOF 7,300 M.c.f.d., GLR 42 M.c.f. per barrel, 53.8°, shut-in TP 2,886 psi., perf. 8,167-69 ft., second Wilcox sand. TD 8,243 ft. Old dry hole worked over and completed as discovery well of Shepherd field.

NORTH TEXAS

Jack County: Lone Star Production Co. 1 M. N. Phillips, 2 miles southeast of Vineyard, W. Berryhill Sur. A-71. IPF 120 BOPD, conglomerate 5,546-56 ft., 30/64-in. choke, 45°; IPP 174 BOPD, Caddo 4,912-17 ft., 42.4°. TD 5,760 ft. Dual oil discovery.

Young County: Norman & Johnson 1 B. W. King, OWWO, 8 miles southwest of New Castle, Sec. 735, TE&L Sur. IPP 84 BOPD, 39°, 25% water, 2,946-49 ft. TD 3,608 ft. New oil discovery.



SALES AND SERVICE REPRESENTATIVES IN CANADIAN AND U. S. OIL CENTERS. FOR SALE THROUGH YOUR FAVORITE SUPPLY STORE—FOREIGN AND DOMESTIC.

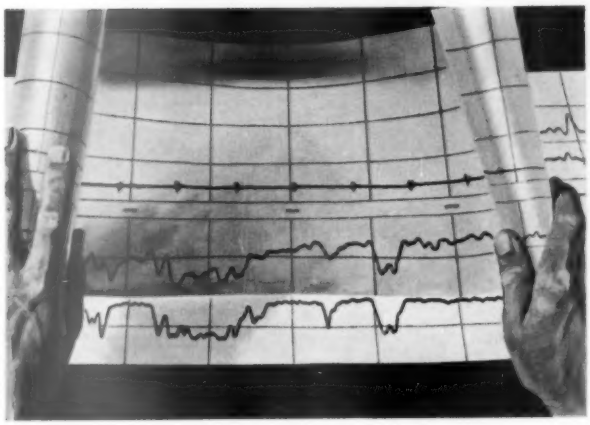
GUN-GAMMA RAY*

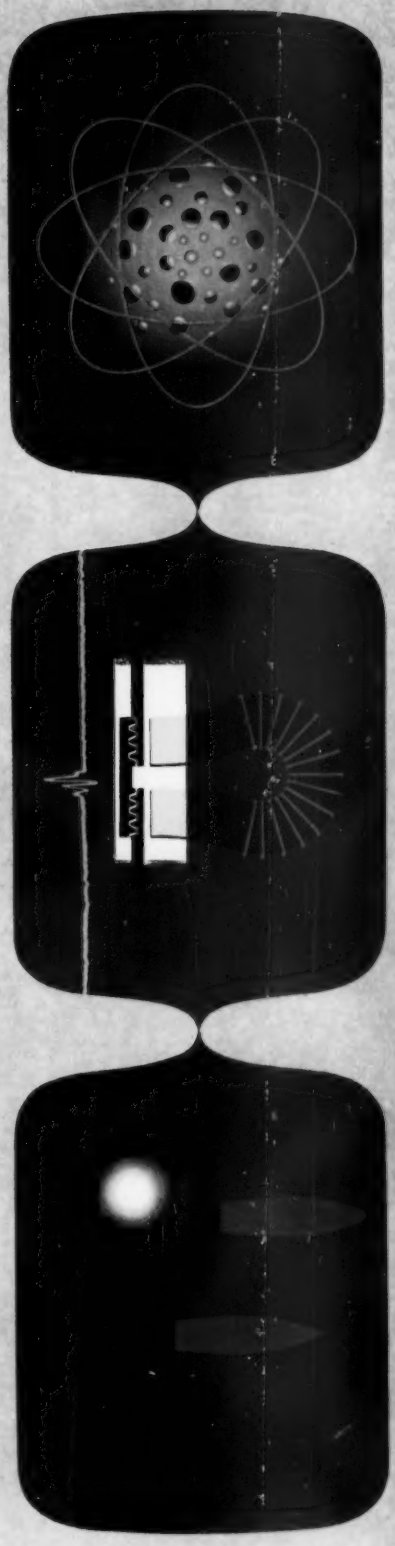
. . . another contribution

to greater efficiency

in oil-well completions

by Schlumberger





3 Operations – 1 Trip in the well

The combined Gamma Ray-Collar Locator-Perforator gives you positive depth control plus casing perforations on one trip in the well. Here is how this means more efficient operation for you:

- *Lower Costs*—Saves costly rig time.
- *Absolute Accuracy*—Gamma Ray correlation with open-hole log positions perforator at exact depth. Collar Locator gives reference depth for additional guns and often locates perforations immediately after shooting.
- *Gamma Ray-Collar Log*—becomes a permanent well record.

Call your nearest Schlumberger office for a discussion of this modern perforating service.

THE EYES OF THE OIL INDUSTRY*

SCHLUMBERGER

*plus Casing Collar Locator

How **DENISON HYDRAULICS** serves the **PETROLEUM INDUSTRY**

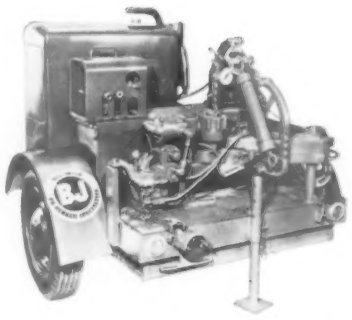
Controlled torque for **BYRON JACKSON** tongs with **DENISON** 2,000 psi hydraulic system

Tubing Tongs—*built by Byron Jackson Tools, Inc., Subsidiary of Borg-Warner Corporation, Los Angeles, California — are operated and controlled by a Denison hydraulic system.*

Here's another way that Denison's 2,000 psi hydraulic systems add savings in operating time to savings in space and weight to help reduce drilling costs.

On the tubing tongs — built by Byron Jackson Tools, Inc. — torque to make up or break out tubing joints is precisely controlled by a Denison 2,000 psi vane-type hydraulic motor. Power for the hydraulic system is supplied by a Denison vane-type pump and regulated through a pressure control valve.

Whenever your operation calls for power—you'll find a hardworking Denison hydraulic system ready to simplify functions and increase reliability. Call in your Denison hydraulic specialist now to check the power needs of your product.



Portable Power Unit *for Denison 2,000 psi hydraulic system with tubing tongs in place for portability.*

DENISON ENGINEERING DIVISION
American Brake Shoe Co.
1176 Dublin Road • Columbus 16, Ohio

BRANCH OFFICES
CALIFORNIA • 1651 East El Segundo Blvd., Hawthorne
OKLAHOMA • 208 Wright Building Annex, 3rd & Cheyenne, Tulsa
TEXAS • 3315 West 12th Street, Houston 24

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

Denison and Denison HydrOILics are registered trademarks of Denison Eng. Div., ABSCO

DENISON HydrOILics

Neel Is Typical? Not Quite

• Tidewater's foreign boss grew up in the oil fields, but waited almost 30 years to get into the business.

A COMMON heritage many oil men seem to share is a childhood spent around an oil field.

Generally, this early oil-field association stirs up the interest which leads to a career in the business.

For instance, take Henry H. Neel, Tidewater Oil Co.'s new manager of foreign exploration and production. He grew up next door to California's huge Ventura Avenue field. And he has had a distinguished career in the oil business.

Put the early association together with his present career and Neel fits the typical oil-man pattern. But there are some differences.

The neighboring oil fields attracted his attention, all right. He hated them. They ruined the swimming in a nearby creek.

Fortunately, Neel didn't let that early experience set him permanently against the business—although it wasn't until years later that he took any interest in it.

Neel went to Stanford University, intent on a career in mining. He graduated with a bachelor's degree in geology in 1934. There was only one thing worse than the oil business in the depression 1930's, and that was the mining business.

So Neel put his sheepskin in mothballs and went back to the family lemon groves in Ventura County.

It wasn't until 1942 that he dusted off his diploma and put his geology to work. He signed on as a sample washer in Tidewater's paleontology lab in Ventura. His stay in the wash basin was brief.

About that time heavy rains caused a number of old landslides to start moving again in the Ventura Avenue field. Neel was tapped to help come up with a counteroffensive.

He helped in developing a solution: Wells were slant-drilled under the bad slide areas from solid ground; underground waters were drained; and surfaces were graded to relieve dangerous conditions. Before the struggle was over, slides either had cut off or badly damaged more than 60 wells in the field.

Into oil . . . By 1948, Neel had worked himself out of the landslides and into petroleum geology.

In 1953, he was named district geologist for Tidewater at Ventura. A year later he was transferred to San Francisco as divisional geologist in the company's head office.

Henry H. Neel

. . . "You've got to go world wide, or die."

From 1955 to the end of 1956, he served as divisional exploration manager. During part of this time he made frequent trips out of the country for Tidewater on a loan-out basis from his own department. In 1957 they made him manager of foreign exploration. In less than 2 years, his travels took him to a number of countries in Europe, the Middle East, Central America, and Alaska.

At the end of 1957, Neel settled down for a spell as manager of exploration for Tidewater back in San Francisco. Last July, Tidewater promoted him again to manager of foreign exploration and production.

His new position also enables Neel to dabble in his first academic love—mining. Neel's department also is in charge of Tidewater's uranium operations in Wyoming's Shirley basin.

His views . . . The new Tidewater foreign operations boss leaves no doubt where he stands on the business of U. S. companies expanding abroad.

"You've got to go world wide or die," he states. "I see the day when U. S. companies' foreign operations will be entirely that—that foreign-produced crude will be shipped to foreign-located refineries and the products marketed in foreign consuming areas," he says.

Neel is equally outspoken about where he feels overseas oil searchers currently are missing a good bet:

"Oil companies haven't faced up to the idea that huge sedimentary basins aren't absolutely necessary for a successful foreign exploratory program. The world is full of small sedimentary basins that are very attractive. Size alone is not the sole criteria for determining a foreign basin's attractiveness.

"If you applied the criteria of size alone, the Los Angeles Basin would never have been discovered," he adds. "It wouldn't even rate a second look today if it were located in Africa. It's that small.

"But, this little basin that wouldn't be considered worth a look elsewhere in the world today, just because of its size, has produced more than 4.75 billion barrels of oil thus far."

Busman's holiday . . . It isn't enough that Neel uses airplanes in his world travels with about the same frequency most use the family auto, but his hobby is in the nature of a busman's holiday. He's an avid private pilot who never misses an opportunity to get out and take a flight in the family plane.

A glance at his club and society memberships offers an insight into Neel's interests. He is a member of the American Association of Petroleum Geologists, the Geological Society of America, the American Association for the Advancement of Science, the Aircraft Owners and Pilots Association, the National Aeronautic Association, and the Lemon Mens Club of California.

Born in California in 1913, Neel moved the family from northern California's Burlingame to southern California's Brentwood Hills when Tidewater switched its headquarters from San Francisco to Los Angeles.

The geology tradition appears safe for at least another generation in the Neel family. Neel's two sons attend Stanford University. One is a geology major.

●

B. H. Loper, with American Cyanamid Co. since 1950, has been appointed manager of refinery chemicals research for the company's industrial chemicals division. He has been technical director of the refinery chemicals department and helped introduce American Cyanamid's high alumina catalyst to the oil industry.

Personals

Keith L. Young, well tester for Northern Natural Gas Co. at Liberal, Kans., has been promoted to associate gas engineer at Omaha.

J. D. Rookus, manager of the Gulf Coast-Mid-Continent area for United Geophysical Corp., has been transferred from Houston to United Testing Laboratories in California.

Charlton H. Lyons, Shreveport independent, and **J. Harold Dunn,** president of Shamrock Oil & Gas Corp., are the 1959 recipients of Texas Mid-Continent Oil and Gas Association's distinguished service awards. The awards will be presented September 16, the final day of the association's fortieth annual meeting in Houston. They are presented annually to an outstanding independent oil and gas producer and an oil-company executive. Lyons has been active in industry affairs throughout the Southwest. He has served as president of the Mid-Continent Oil and Gas Association and of its Louisiana-Arkansas Division, also as president of the Independent Petroleum Association of America. Dunn has been president of Shamrock since 1945. He first worked for the company in 1937 on loan from Lone Star Gas Co. to run engineering value surveys on Shamrock properties. He was named a vice president of Shamrock in 1939.

DUNN

LYONS

David B. Barlow has been appointed comptroller of California Chemical Co., subsidiary of Standard Oil Co. of California. Barlow will take over his new assignment in San Francisco after 4 years as secretary-treasurer of two other California Standard subsidiaries, Salt Lake Pipe Line Co. and Salt Lake Refining Co., Salt Lake City, Utah. Barlow has been with the California Standard organization since 1947 when he joined Salt Lake Pipe Line Co. as accounting supervisor. He subsequently served as office manager and assistant secretary-treasurer of the two Salt Lake companies.

Donald S. Kennedy, president and chairman of the board of Oklahoma Gas & Electric Co., Oklahoma City, has been elected a director of Fain-Porter Drilling Co.

John W. McCulley, Denver, Rocky Mountain marketing operations manager for Continental Oil Co., has been promoted to manager of the Houston marketing division.

Albert B. Dickas, Magnolia Petroleum Co. geologist at Morgan City, La., has taken a leave of absence to begin work toward a Ph. D. in geology at Michigan State University. He will specialize in stratigraphy and sedimentation.

Dr. Joseph L. Gillson of Wilmington, Del., chief geologist of Du Pont, will be the 1960 president of the American Institute of Mining, Metallurgical, and Petroleum Engineers. He and other newly elected officers will take office during the AIME's annual meeting in New York February 14-18. Gillson will succeed **Howard C. Pyle,** Los Angeles, president, director and chairman of the executive committee of Monterey Oil Co. The AIME also named a president-elect to become president in 1961. He is **Ronald E. McNaughton,** of Trail, B. C., manager of the metallurgical division of Consolidated Mining & Smelting Co. of Canada, Ltd. He is a former director of AIME. AIME vice presidents taking office in February are: **Dr. John Chipman,** head of the Massachusetts Institute of Technology's department of metallurgy; **Stanley D. Michaelson,** Salt Lake City, chief engineer of Western mining division, Kennecott Copper Corp.; **Jerome W. Woomer,** Pittsburgh, head of J. W. Woomer & Associates; **Basil P. Kantzer,** Houston, vice president of Union Oil Co. of California; **John P. Hammond,** Tulsa, assistant general superintendent of production department, Amerada Petroleum Corp.; and, for a second term, **Dr. Walter R. Hibbard, Jr.,** Schenectady, N. Y., manager of alloy studies research of General Electric Research Laboratory. New directors, who will serve until February 1963, are: **Raymond H. Frierabend,** New Orleans, assistant vice president, Freeport Sulphur Co.; **James C. Gray,** Pittsburgh, vice president, coal operations, U. S. Steel Corp.; **James B. Austin,** Pittsburgh, vice president, research and technology, U. S. Steel Corp.; **J. S. Smart, Jr.,** New York, general sales manager, American Smelting & Refining Co.; and **Herbert F. Beardmore,** Houston, manager of Gulf Coast district of Gulf Oil Corp.

Ralph M. Knight has been appointed a vice president of U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation. In the newly created post, Knight will intensify USI's long-range polyolefin development program. He will continue to direct the Polymer Service laboratory and coordinate its efforts with other plastics activities within the company. Since joining National Distillers in 1953, Knight has served as polyethylene manager, polyethylene production manager, assistant to the vice president for production, and manager of polyolefin planning. Prior to joining National Distillers, Knight was in the research department of Standard Oil Co. (Ind.) and the ammonia and polychemicals department of Du Pont.

Robert E. McWilliams, production engineer for Humble Oil & Refining Co., at Conroe, Tex., has joined United Production Co. at Monroe, La., as a production engineer.

Richard M. Morrow has assumed duties as district superintendent of Pan American Petroleum Corp.'s New Orleans district. He joined Pan American in 1948 as petroleum engineer at Alvin, Tex., and has served as assistant division engineer in Houston the last year.

Robert D. Garrett has been appointed consulting petroleum geologist for Lincoln Oil & Gas Co., Inc. of Louisville. He will headquarter at Owensboro, Ky., and direct geological work on 6,000 acres of leases in south-central Kentucky. A graduate of the University of Illinois in 1948, Garrett has done consulting work the last six years at Owensboro.

New officers of the Chemical Industry Association, elected at the recent annual meeting in Lakeville, Conn., are: **Fred A. Escherich,** Mobil Oil Co., president; **Erhart K. Dreschsel,** Escambia Chemical Corp., vice president; **William W. Kolyer Jr.,** American Potash & Chemical Corp., treasurer; **Richard S. Mooney,** Continental Oil Co., secretary; **Pauline Newman,** Food Machinery & Chemical Corp., general counsel. Directors elected are **Robert S. First** of Robert S. First, Inc.; **Paul E. McCoy** of American Potash & Chemical Corp., and **Herbert W. McNulty,** Allied Chemical Corp.

▶▶▶ Personals

Mayo Curtis, reservoir engineer for Tidewater Oil Co.'s western division, has been assigned to Tidewater's production research group in Houston. He joined Tidewater in 1948 as draftsman in Los Angeles, served as production engineer at Ventura, returning to Los Angeles as reservoir engineer. He became division reservoir engineer in 1957.

Dr. Charles A. Anderson has been appointed administrative geologist and chief of the geologic division, United States Geological Survey, Interior Secretary Fred A. Seaton announced. Dr. Anderson taught at the University of California from 1926 to 1942 and has been with the survey since 1942. He directed a special program of national resource appraisals conducted for the Defense Minerals Exploration Administration, the Atomic Energy Commission and the Department of Defense.

Merrill Rasmussen, area production manager in Edmonton for British American Oil Co., Ltd., has joined Pacific Petroleums, Ltd., as manager of production. He will replace **Kelly H. Gibson,** who recently stepped up from production vice president to executive vice president and a director of the company. In other changes, **R. E. Manahan,** assistant manager of lands, has been named manager of lands and **J. B. Ballem,** executive assistant, has been named to the new position of manager of the service department.

RASMUSSEN

John W. Russell has been promoted from advanced process engineer to assistant supervisor of the process engineering department of Ohio Oil Co.'s Robinson, Ill., refinery. Russell started at the refinery as a chemist in 1941.

Dr. Robert A. Ruehrwein and **Dr. John D. Calfee** have been promoted to assistant directors of the research department of Monsanto Chemical Co.'s research and engineering division. Dr. Ruehrwein will be in charge of inorganic, physics, physical chemistry, and analytical research groups and Dr. Calfee will direct research in polymer synthesis and evaluation. Both formerly were section leaders.

L. M. Sloan, formerly district supervising engineer with Humble Oil & Refining Co. at Paradis, La., has been transferred to New Orleans as supervising engineer.

C. E. Smith is manager of operations for Union Oil Co. of California's new Alaska division. Others assigned to the division are **Harold Lian,** division geologist; **W. E. Thompson,** division landman; **Lummie C. Lovely,** geologist, **Joe Dockwiller,** scout, and **Duncan B. Robinson,** geophysicist. Union is doing exploratory drilling on Kenai peninsula and has a participating interest in Swanson River unit development operations.

Dr. Wendell P. Metzner has been named administrative director of Monsanto Chemical Co.'s new research center, to be built in suburban St. Louis. He is assuming the new position immediately to aid in planning new facilities and to serve as advisor and coordinator between research divisions using the new science center. Dr. Metzner has been with Monsanto since 1936.

Robert M. Adams has been transferred to Pittsburgh, Pa., as chemical engineer with Gulf Oil Corp. He formerly was in Gulf's chemical engineering department at its Philadelphia refinery.

Frank C. Pfeiffer, Jr., has been named natural-gas engineer with Magnolia Petroleum Co. at Lake Charles, La. He formerly was plant engineer for Magnolia at Opelousas, La.

Fred M. Traweek, former vice president of Eastern States Petroleum & Chemical Co., has formed Traweek Oil Co. in Houston. The company will deal principally in crude purchasing but also will have leasing, drilling, and production interests. Traweek worked 22 years with Eastern States, was vice president of crude-oil purchases and sales, and executive vice president of Nantucket Pipe Line Co., a subsidiary. He has been a partner in Tauber Oil Co. for the past 2 years.

Four promotions in El Paso Natural Gas Products Co.'s engineering department have been announced. **Paul F. Schmidt,** chief process engineer, becomes chief technical supervisor. **James C. Arnold,** chief electrical engineer, was promoted to chief general engineering supervisor. **Keith Claiborne** succeeds Schmidt as chief process engineer. **J. H. Riddle,** assistant to the superintendent of refineries, becomes chief, technical services.

B. E. Yester, area petroleum engineer with The Ohio Oil Co., has been transferred to Cody, Wyo. as foreman. He formerly was stationed at Grass Creek, Wyo.

WILSON

J. E. Wilson, acting Houston area exploration manager for Shell Oil Co., has been nominated to succeed **E. D. Cumming,** who will retire at the end of this year as vice president of Shell's Houston area. Wilson joined Shell in 1938. He has held various positions in exploration at Tyler, Houston, Wichita Falls, Oklahoma City, Tulsa, and Casper. He was manager of the Rocky Mountain exploration department at Denver before being transferred to Shell Development Co. in Houston in 1958 as director of exploration research. He was named to his present position last July. Cumming has been with Shell for 36 years. While vice president, manufacturing, in 1942, he was named by the Secretary of Interior as national director of refining for the Petroleum Administration for War.

Four promotions in its special projects and planning division have been announced by Delhi-Taylor Oil Corp. **Dr. Elton Soltes** has been assigned over-all responsibility for the division, succeeding **J. W. Bartlett,** vice president, who retired. **G. R. Gamble** has been made director of the new planning department, **B. J. Beard** has been named director of the natural gas and pipeline department and **Frank M. Coker** is new engineering advisor for the special projects division. Beard and Coker are vice presidents of Delhi Pipeline Corp.

Dr. W. Ralph Meador of Continental Oil Co.'s research staff at Ponca City, Okla., has been promoted to senior research chemist in the petroleum production division. Dr. Meador joined Conoco in 1956 after receiving his doctor's degree in chemistry from Rice Institute.

R. S. Terry, land agent in Houston for Shell Oil Co., has been made Houston division land manager. **W. R. Kemper** and **G. A. Koerner,** formerly division land managers in Corpus Christi and Houston, have been made area land agents stationed in Houston.

Arthur O. Spaulding, an engineer for the city of Los Angeles and State of California, has opened geological consulting offices at Pasadena, Calif. Spaulding formerly worked for Shell Oil Co. as an exploitation engineer.

Personals

SCHUMACHER

F. William Schumacher, manager of the Everett, Mass., refinery of Esso Standard Oil Co., has been named petroleum research coordinator at Esso's New York headquarters. This as a new post in the Esso organization. Schumacher will be succeeded at Everett by **William J. Sheridan,** operations superintendent at Esso's Bayway refinery, Linden, N. J. Schumacher, who joined Esso in 1930, has been manager of the Everett plant since 1954. He formerly was manager of the company's technical-service division and served 19 years with Esso Research & Engineering Co. Sheridan was head of the technical department, process superintendent, and assistant general superintendent at the Baltimore refinery before going to Bayway in 1955.

William H. Ruehle, research geophysicist at Magnolia Petroleum Co.'s field research laboratory in Dallas, has received a 3-year Socony Mobil Incentive Fellowship. The award allows him up to 3 years at the University of California to study toward his doctorate in geophysics. He receives full pay.

A. J. McAlister, formerly with Warren Petroleum Corp., in Tulsa, and **R. C. Crouch,** formerly with Trend Construction Co., Oklahoma City, have purchased Pioneer Oil Field Construction Co., Oklahoma City, and moved the offices to Tulsa. They purchased the company from **W. C. Hall,** El Reno, Okla. The company is doing general oil-field construction work in the Laverne area of Oklahoma and plans to expand into gasoline-plant construction.

Melvin R. Springer, Little Rock district manager of Lion Oil Division, Monsanto Chemical Co., has been appointed marketing consultant to the general headquarters management of Lion at El Dorado, Ark. He was succeeded by **W. King O'Leary,** assistant district manager.

Ira A. Wyant, production geologist for Shell Development Co. at Houston, has been transferred to Oklahoma City in the same position with Shell Oil Co.

Orville Roberts is manager of the newly-created organization and personnel development department of Sinclair Pipe Line Co., Independence, Kans. He formerly was administrative assistant. Roberts, a 1946 graduate of the University of Kansas, has supervised the company's internal information and educational program since 1956.

Kenneth G. Smith, assistant district superintendent at Ferriday, La., for Interstate Oil Pipe Line Co., has been promoted to district superintendent at Vivian, La. Smith succeeds **George G. Hughes, Jr.,** who is on rotational training as acting district superintendent at Vivian. Hughes returns to the general office in Shreveport, where he will be acting manager of operating staff services for 4 months. He then is expected to resume his permanent assignment as chief engineer. **Carlos C. Rabb, Jr.,** LPG foreman in the Baton Rouge-Sorrento area, has been promoted to district foreman in Ferriday. Rabb has been succeeded by **Jesse H. Shelby,** field gager in the Vivian district.

Robert P. Evans has resigned as vice president and director of Kin-Ark Oil Co. and has opened an office as consulting geologist in Shreveport. He was graduated in 1942 from the University of Oklahoma and held geological posts with Magnolia Petroleum Co. and Lion Oil Co. before joining Kin-Ark in 1957.

Richard S. Tremaine has been appointed geological research director at Pan American Petroleum Corp.'s research center in Tulsa. He replaces Thomas A. Hendricks, resigned. Tremaine joined Pan American in Houston in 1948 and has held geological posts in New Orleans, San Antonio, and Casper.

Deaths

Edgar S. Sherar, 55, chief geophysicist for Tidewater Oil Co., died September 3 in his home in Houston following a lengthy illness. Sherar began as a geophysicist with Humble Oil & Refining Co. in 1924. In 1929, he went to Batavia as chief geophysicist for an affiliate of Standard Oil Co. (N. J.). He returned to the United States in 1938 and joined Tidewater.

W. B. Cotten, manager of public relations for the Baton Rouge refinery of Esso Standard Oil Co., died of a heart ailment August 25 at his home in Baton Rouge. Cotten was a 43-year veteran of the Jersey Standard organization. He joined the company in 1916 as a stenographer for the old Standard Oil Co. of Louisiana and later served in executive capacities with Jersey in New York, New Orleans, and Baton Rouge. Cotten was named manager of the public relations department of the Baton Rouge refinery when the department was organized in 1945.

Robert E. (Jimmy) James, 51, export sales manager for Security Engineering Division, one of the Dresser Industries, died August 29 in London, England, following an emergency operation.

Tom Godfrey, 67, retired Texaco refinery operating engineer, died September 5 in his home in Tulsa. He had been ill for some time with uremic poisoning. Godfrey was employed at the Texaco refinery for 40 years before his retirement 2 years ago.

Albert Oscar Bettes, 72, retired Carter Oil Co. employe, died September 4 in his home in Tulsa following a long illness. Bettes joined Carter in 1920 and was assistant unit head of the part interest division when he retired in 1951.

Morris Rauch, 63, Houston oil man, died August 31 in a Houston hospital. Rauch was co-owner of Wirt Franklin Petroleum Co. from 1919 to 1955.

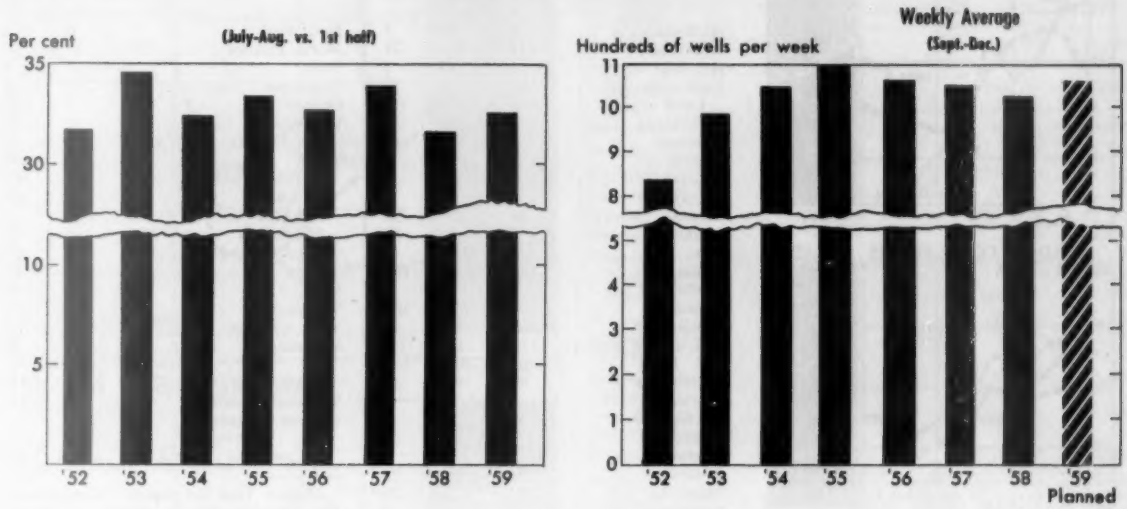
James H. Cockburn, 32, president of Cockburn Oil Corp., died September 1 in Houston, after a 3-year illness. He had served as president of the firm, founded by H. C. Cockburn, his father, the past six years. He also had sulfur interests in Mexico.

Francis Marion Richardson, 81, died Aug. 28 at his home in Bakersfield, Calif. He was employed for 40 years as an electrician by General Petroleum Corp.

Alexander Duvall, 85, retired machinist formerly with the Honolulu Oil Corp., died August 28 at his home in Taft, Calif. His widow, one son, three daughters, 12 grandchildren and 18 great-grandchildren survive.

Fred Paul Schweers, 43, Tulsa consulting geologist, died September 4. Schweers was exploration manager for Mercury Drilling Co., Tulsa, before opening an office as a consulting geologist last June.

WELL COMPLETIONS



Steel strike slows drilling rate

BY JOHN C. CASPER

WELL COMPLETIONS for July and August have been low. Operators will have to step up the pace in the last 4 months if they are to drill all of the 52,000 wells scheduled at midyear.

The first of the above charts pictures completions for July and August, expressed as per cent of total completions for the first half of the year. For each year, the July-August total is the sum of the 8 full weeks in the period.

Take the year 1953 as an example. Operators completed 7,991 wells in the 8 full weeks of July and August. But, they drilled only 23,163 wells in the entire first half of the year. The 8-week total was 34.5% of total completions for the first half. That was the highest ratio in the past 8 years. The high level of drilling in July and August that year was due to a change in drilling plans for the last half. Operators wound up the year by completing almost 13% more wells in the last half than in the first.

The year 1953 was used as an example because it had a rising trend in drilling throughout the year. Reports from operators at the end of June this year pointed to a big increase in the last 6 months. Total wells completed in the first half amounted to 24,367 wells. This total represented a gain of 1,379 wells over the first half of 1958, but it was below first-half completions for years 1954 through 1957.

Operators' plans at the end of June this year called for almost 27,600 wells in the last half. This would have been a gain of 13.8% over the first half.

If oil men complete 27,600 wells in the last 6 months of the year, they will have to average about 1,068 wells per week for the remainder of the year.

The second part of the chart shows average weekly drilling in the September-December period for the past 8 years. The highest average was in 1955 when operators completed almost 1,100 wells per week for the 4-month period. There has been a decline every year since that time, but the trend will be reversed this year.

The September-December average last year was 1,022 wells per week. There is a good chance that drilling will be above that average for the next 4 months. However, the last half total will be influenced by the steel strike.

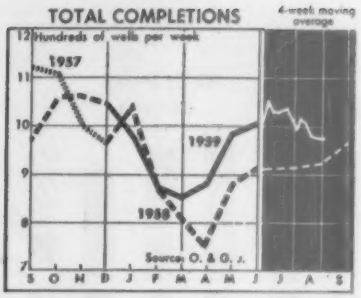
There was a steel strike in 1952 that lasted for about 8 weeks. Completions for the last 4 months of that year averaged only 834 wells per week. Part of the loss was due to shortage of pipe and part to the feeling of uncertainty during a prolonged strike.

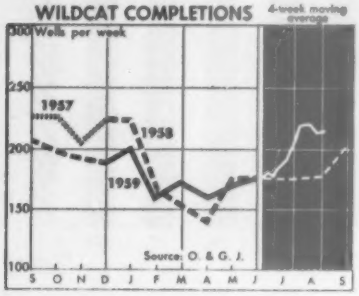
There has been no major shortage of pipe so far this season, but it will be scarce if the strike runs longer than 3 months. Residual fuel is the only major product showing decreases in demand. However, gasoline demand is up less than 3.0%. The steel strike is acting as a brake on the entire economy. The drag is showing up in drilling.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,807,120	UP	34,730	DOWN	256,330
Crude stocks	253,353,000	DOWN	4,727,000	UP	5,629,000
Completions	991	DOWN	22	UP	5
Refinery runs	8,132,000	DOWN	230,000	UP	150,000
Gasoline stocks	181,509,000	DOWN	1,573,000	UP	7,008,000
Kerosine stocks	31,354,000	UP	310,000	UP	2,489,000
Distillate stocks	163,198,000	UP	3,657,000	UP	20,989,000
Residual stocks	57,507,000	UP	1,058,000	DOWN	10,575,000
Four-product stocks	433,568,000	UP	3,452,000	UP	19,911,000
Total imports	1,707,400	UP	382,500	UP	299,700

DRILLING





Active Rotary Rigs

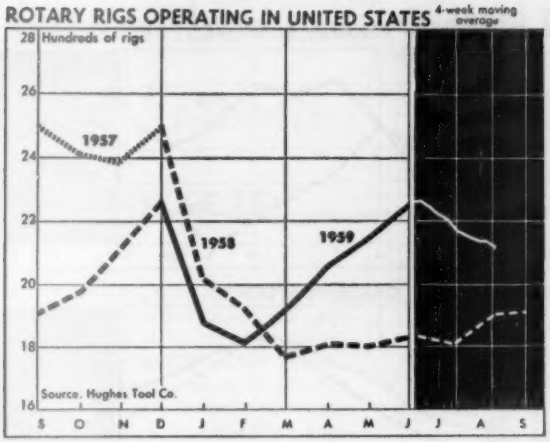
	9-7-59	8-31-59	9-8-58
Alabama	9	9	5
Arkansas	18	14	21
Arizona	2	2	2
California	106	100	70
Land	100	94	(*)
Offshore	6	6	(*)
Colorado	55	57	47
Florida	1	1	1
Land	1	1	1
Offshore	0	0	0
Illinois	48	44	53
Indiana	9	9	12
Iowa	2	2	3
Kansas	135	130	146
Kentucky	8	8	6
Louisiana	326	334	304
North	34	39	39
S. Inland waters	125	135	(†)
S. Land	105	108	228
Offshore	62	52	37
Maryland	0	0	0
Michigan	30	31	10
Mississippi	70	69	45
Missouri	0	0	1
Montana	31	30	20
Nebraska	31	29	25
Nevada	2	1	0
New Mexico	122	120	99
New York	0	0	0
North Dakota	19	27	30
Ohio	3	3	1
Oklahoma	220	203	218
Oregon	0	0	0
Pennsylvania	8	11	9
South Dakota	6	9	3
Texas	745	748	692
S. Inland waters	5	5	(†)
S. Land	196	198	133
Offshore	2	2	0
North-East	176	184	(*)
West Central	241	235	(*)
West	125	124	(*)
Utah	31	33	30
Washington	2	2	1
West Virginia	5	8	4
Wyoming	88	73	61
Total U. S.	2,132	2,107	1,921
Western Canada	150	136	148
Eastern Canada	1	0	3
Grand total	2,283	2,243	2,072

Hughes Tool Co. report. *Comparisons not available due to change in method of reporting. †Included in South-Land.

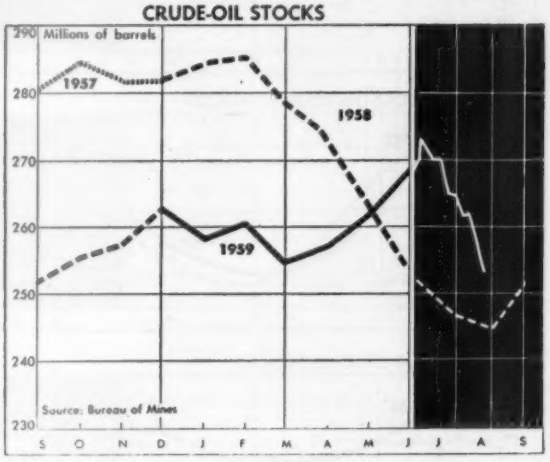
WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 5, 1959

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	2	1	0	0	1	0	13,912	65	50	1	0	0	0	1	17	19
Arkansas	14	9	0	2	3	0	43,340	565	504	1	0	0	1	0	97	112
California	35	21	0	0	9	5	171,569	1,027	1,098	8	2	0	0	6	256	256
Colorado	27	2	0	6	19	0	152,718	529	552	15	0	0	2	13	315	320
Illinois	76	36	0	1	39	0	171,696	1,531	1,452	21	4	0	0	17	262	287
Indiana	21	7	0	0	14	0	32,102	559	505	12	2	0	0	10	190	183
Kansas	68	28	0	1	37	2	222,818	2,715	2,547	22	1	0	1	20	649	544
Kentucky	29	3	0	0	26	0	29,739	1,643	779	18	0	0	0	18	161	98
Louisiana	91	40	11	6	34	0	598,998	2,506	2,323	11	0	0	2	9	337	338
North	49	24	0	5	20	0	151,133	956	836	7	0	0	2	5	145	139
South	31	13	8	1	9	0	329,675	1,284	1,176	4	0	0	0	4	179	179
Offshore	11	3	3	0	5	0	118,190	266	311	0	0	0	0	0	13	20
Michigan	12	4	0	0	8	0	41,371	425	282	4	0	0	0	4	107	91
Mississippi	10	1	1	0	8	0	80,191	420	264	4	0	0	0	4	191	121
Montana	7	3	0	0	4	0	24,348	217	227	5	1	0	0	4	68	96
Nebraska	16	4	0	0	12	0	96,773	597	480	3	0	0	0	3	253	224
New Mexico	37	20	1	13	3	0	167,462	1,379	1,350	4	1	0	0	3	163	180
West	18	5	1	12	0	0	85,599	627	652	0	0	0	0	0	44	76
East	19	15	0	1	3	0	81,863	752	698	4	1	0	0	3	119	104
New York	23	12	0	1	3	7	38,787	195	403	2	0	0	0	2	18	37
North Dakota	9	5	1	0	3	0	64,983	335	312	1	0	0	0	1	62	102
Ohio	16	8	0	2	4	2	42,133	659	725	0	0	0	0	0	21	12
Oklahoma	129	59	2	15	51	2	548,352	3,918	4,331	23	3	0	3	17	587	595
Pennsylvania	0	0	0	0	0	0	0	335	418	0	0	0	0	0	9	9
Texas	334	177	13	18	122	4	1,480,685	12,938	12,172	64	7	2	0	55	2,435	2,477
Dist. 1	10	2	0	2	5	1	40,806	759	658	3	0	0	0	3	217	265
Dist. 2	14	5	2	1	6	0	94,196	540	511	5	0	1	0	4	161	134
Dist. 3	24	10	2	0	12	0	170,068	824	871	9	1	1	0	7	165	195
Dist. 4	29	5	5	5	14	0	157,533	907	815	7	1	0	0	6	225	239
East	32	24	1	1	6	0	101,355	842	832	4	0	0	0	4	160	229
Dist. 7-B	36	16	1	1	18	0	127,486	1,772	1,643	16	4	0	0	12	472	468
West	96	67	1	1	25	2	520,310	3,968	3,521	9	1	0	0	8	550	487
Dist. 9	81	43	1	3	33	1	226,362	2,436	2,455	11	0	0	0	11	412	389
Dist. 10	12	5	0	4	3	0	42,569	890	866	0	0	0	0	0	73	71
Utah	6	4	0	0	2	0	30,218	211	268	1	0	0	0	1	57	58
West Virginia	11	4	0	4	3	0	25,078	522	492	1	0	0	1	0	19	12
Wyoming	17	6	0	1	9	1	80,516	668	487	5	0	0	0	5	227	143
Misc. (Ariz.)	1	0	0	0	1	0	3,811	88	64	1	0	0	0	1	55	55
Total U. S.	991	454	29	70	415	23	4,161,600	34,047	32,085	227	21	2	10	194	6,556	6,369
Previous week	1,013	493	21	86	396	17	4,293,418	.....	.....	208	22	2	12	172	.....	.....
Cum. 1959	34,047	17,156	831	2,472	12,709	879	141,462,107	.....	.....	6,556	623	86	206	5,641	.....	.....
Cum. 1958	32,085	15,749	791	2,439	12,290	816	133,285,434	.....	.....	6,369	620	108	188	5,453	.....	.....
Western Canada	49	31	0	9	9	0	254,205	1,689	1,674	12	2	0	2	8	478	448
Ontario	0	0	0	0	0	0	0	154	.....	.....	.....	.....	.....	.....	.....	.....

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-29-59	8-22-59	8-30-58
Pennsylvania	2,692	2,685	2,954
Other Appalachian	2,085	2,128	1,431
Illinois, Indiana, Michigan	9,632	9,811	10,653
Nebraska and North Dakota	2,715	3,060	2,244
Kansas	10,066	10,005	9,335
Oklahoma	16,000	15,832	15,407
Arkansas	2,175	2,148	1,733
Louisiana	18,748	18,761	16,767
North	3,396	3,283	2,886
South	15,352	15,478	13,881
Mississippi, Alabama, Florida	2,563	2,639	2,624
New Mexico	7,741	7,857	7,826
Texas	107,751	110,569	101,895
East Texas	8,515	8,707	7,895
West Texas	50,570	52,673	50,153
Texas Gulf	18,953	19,202	17,977
Other Texas	29,713	29,987	25,870
Wyoming	15,444	15,787	12,688
Other Rocky Mountain	10,212	10,019	8,846
California	31,149	31,429	36,792
Foreign	†14,380	15,350	15,554
Total	**253,353**	258,080	246,749

*Bureau of Mines. †Includes 4,127,000 bbl. in California.

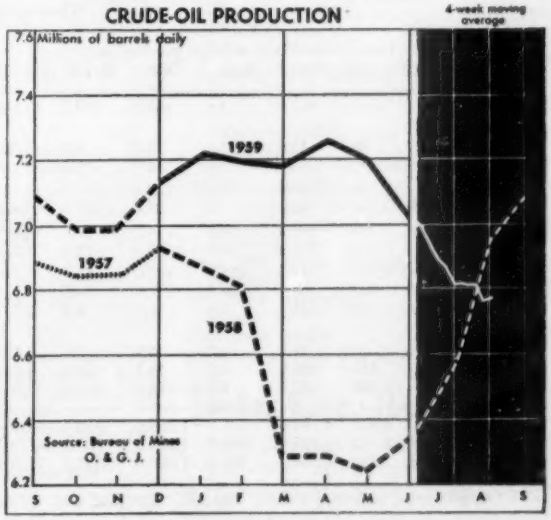
DAILY AVERAGE PRODUCTION FOR WEEK

	September 5, 1959 Crude oil	Lease condensate	Total	Aug. 29 total
Alabama	16,170	...	16,170	16,150
Arkansas	47,600	300	47,900	46,500
California	846,300	...	846,300	847,500
Colorado	126,400	...	126,400	126,100
Eastern	39,800	...	39,800	40,000
Florida	1,170	...	1,170	1,130
Illinois	216,200	...	216,200	211,300
Indiana	32,700	...	32,700	32,400
Kansas	†309,650	...	†309,650	†312,140
Kentucky	88,700	...	88,700	92,800
Louisiana	899,200	98,800	998,000	992,300
North	109,770	5,050	114,820	114,800
South	789,430	93,750	883,180	877,500
Michigan	27,900	...	27,900	27,400
Mississippi	135,980	3,770	139,750	137,250
Montana	81,500	...	81,500	79,600
Nebraska	63,800	...	63,800	62,400
Nevada	100	...	100	100
New Mexico	283,650	4,900	288,550	285,500
North Dakota	38,400	...	38,400	38,800
Oklahoma	†503,700	...	†503,700	†509,000
Texas	2,411,150	70,020	2,481,170	2,456,480
Dist. 1	42,430	2,000	44,430	45,300
Dist. 2	101,270	7,600	108,870	106,600
Dist. 3	315,000	35,800	350,800	350,500
Dist. 4	169,150	8,200	177,350	176,500
Dist. 5	28,300	300	28,600	28,350
Dist. 6	103,720	6,200	109,920	108,200
East Texas field	131,000	...	131,000	129,000
Dist. 7-B	131,420	100	131,520	130,100
Dist. 7-C	114,150	3,020	117,170	116,230
Dist. 8	962,150	4,200	966,350	949,000
Dist. 9	203,280	1,600	204,880	206,600
Dist. 10	109,280	1,000	110,280	110,100
Utah	114,800	...	114,800	114,900
Wyoming	344,100	...	344,100	342,300
Others	‡360	...	‡360	‡340
Total U. S.	6,629,330	177,790	**6,807,120**	6,772,390
Change from prev. week, up			**34,730**	
Canada	†549,000	...	†549,000	†555,300

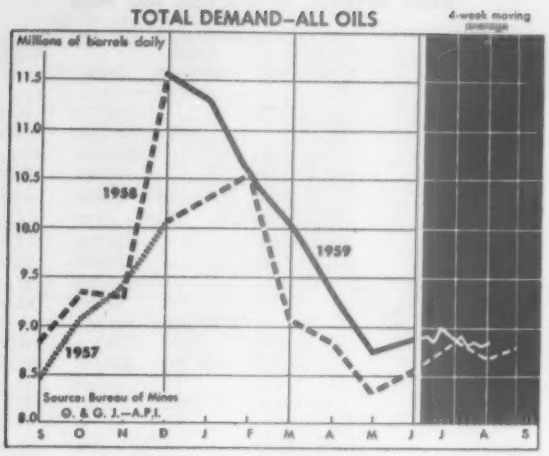
Total U. S. prod.—January 1-September 5 ... 1,754,288,470 bbl.
Same period last year (crude plus cond.) ... *1,624,292,370 bbl.

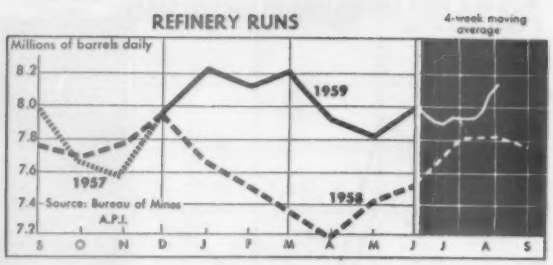
*Includes 39,019,120 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota, and Washington.

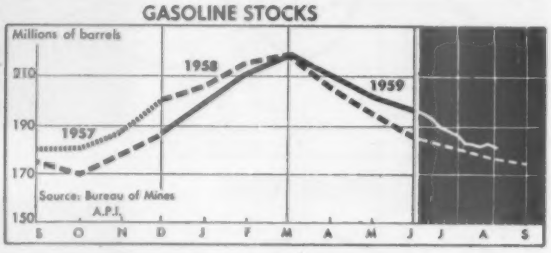
CRUDE-OIL PRODUCTION

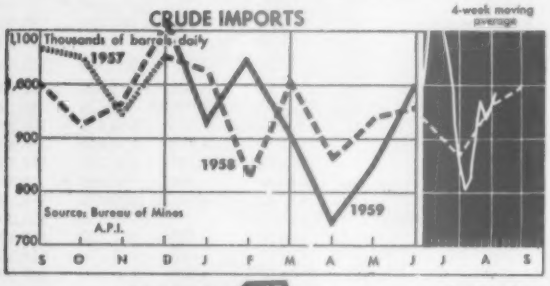


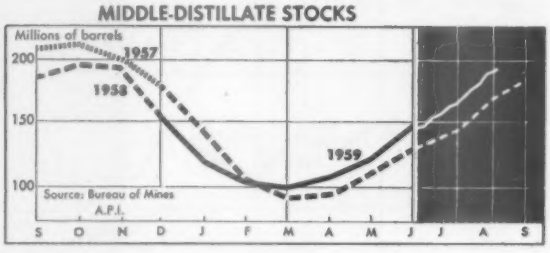
REFINING

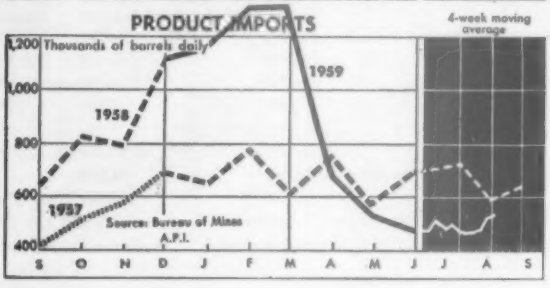


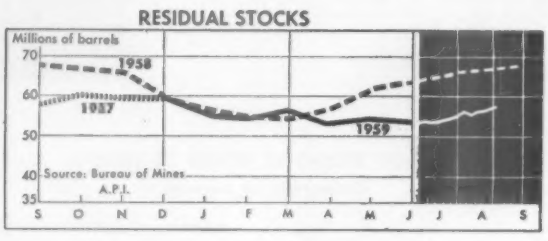












API REFINERY REPORT—SEPTEMBER 4, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1958 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,103	588.4	33.4	345.1	147.9	43,540	12,540	63,115	11,864	1,135	529.4	31.3	313.1	202.0
Appalachian:														
District 1	99	46.6	1.7	23.1	6.4	5,782	640	3,851	377	103	44.6	4.6	21.9	6.8
District 2	102	52.0	1.0	18.3	8.7	2,704	494	1,640	423	96	51.3	5.4	20.7	6.8
Ind., Ill., Ky.	1,416	763.2	40.1	328.4	133.1	31,537	7,508	27,435	5,628	1,387	739.5	59.5	305.2	128.7
Minn., Wis., Dak.	104	50.9	0	29.6	11.4	6,469	1,435	7,597	443	76	31.3	1.7	21.8	8.6
Okla., Kans., Mo.	734	393.4	14.9	174.2	16.9	16,891	1,595	11,146	804	704	401.2	12.3	171.4	21.4
Inland Texas	316	233.4	6.9	58.3	21.6	7,533	497	2,077	2,150	270	201.9	11.2	46.8	22.1
Texas Gulf Coast	1,917	947.0	115.7	405.0	183.3	21,210	3,292	18,397	6,292	1,798	910.1	90.4	470.2	197.9
La. Gulf Coast	665	366.1	44.7	151.0	44.0	9,021	1,912	7,306	1,566	665	383.5	53.5	158.0	46.8
N. La. and Ark.	70	38.0	4.6	11.9	4.0	4,731	617	2,343	181	86	36.8	5.8	20.8	6.6
Rocky Mtn.:														
New Mexico	27	17.4	0.7	5.0	3.4	821	52	188	79	25	13.1	0.5	4.8	2.4
Other	319	148.9	4.3	59.7	36.9	4,643	373	3,092	1,156	285	130.0	5.6	58.3	30.0
West Coast	1,260	547.3	8.0	186.0	292.8	26,627	399	15,011	26,544	1,133	504.9	3.0	170.5	293.1
Sept. 4, 1959	8,132	4,192.6	276.0	1,795.6	910.4	181,509	31,354	163,198	57,507	7,763	3,977.6	284.8	1,783.5	973.2
Aug. 28, 1959	8,362	4,308.9	303.0	1,836.3	905.4	183,082	31,044	159,541	56,449	.....	.....	.....	.....	.....
Sept. 5, 1958	7,982	4,048.0	245.7	1,785.6	1,007.3	174,501	28,865	142,209	68,082	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

September is critical month for markets

HIGH PRODUCT INVENTORIES are causing a further buildup of pressure on wholesale prices. For the last full week in August, major product stocks increased almost 9,000,000 bbl. Middle distillate accounted for better than 75% of the increase, but gasoline showed a contraseasonal gain of better than 1,600,000 bbl.

Soft markets tend to show up in the areas where stocks are much higher than last year. Gasoline stocks are almost 10,000,000 bbl. above last year with the increases spotted in coastal areas. Gulf Coast prices have been low for most of the summer, and the stock gains for the last week in August did nothing to relieve the pressure.

Formal quotations for 92-octane regular gasoline on the Gulf Coast have held at 11.00 cents a gallon since late July. However, recent reports of prices quoted for deliveries on the river above Memphis would net only about 10.50 cents back at the gulf. The general feeling is that the 11.00-cent cargo price can be shaded by as much as 0.375 cent a gallon for cargo lifting after the middle of this month.

Marketers are keeping a close watch on distillate stocks for a hint of a further break in prices. East Coast distillate stocks are up 14,000,000 bbl. from last year, and Gulf Coast shows a gain of better than 5,000,000 bbl. The generally quoted low for No. 2 fuel in cargo lots is 7.75 cents a gallon. That is the lowest August price since 1950. The big question early in September is: "Will the 7.75 cents hold until cold weather cuts inventories?"

Group 3 gasoline prices climbed in late July and early August from 10.875 cents to 11.75 cents, but pressure on the market early in September has cut some of the gain. Group 3 regular gasoline is available to the close-buying jobber at 11.50 cents a gallon. There have been unconfirmed reports of sales to big jobbers at slightly less. Prices for regular grade are about in line with quotations for September 1957, but quality is up two octane numbers.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill,§ Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.49	....	$2.35	2.06
21-21.9	2.50	2.52	....	2.38	2.11
22-22.9	2.60	2.55	....	2.41	2.16
23-23.9	2.69	2.58	$3.44	2.44	2.21
24-24.9	2.78	2.61	3.46	2.47	2.26
25-25.9	2.84	2.64	3.48	2.50	2.31
26-26.9	2.90	2.67	3.50	2.53	2.36
27-27.9	2.95	2.70	3.52	2.56	2.49
28-28.9	3.01	2.73	3.54	2.59	2.54
29-29.9	3.07	2.76	3.56	2.62	2.59
30-30.9	3.12	2.79	....	2.65	2.63
31-31.9	3.20	2.82	....	2.68	2.67
32-32.9	3.27	2.85	....	2.71	2.71
33-33.9	3.34	2.88	....	2.74	2.75
34-34.9	3.41	2.91	....	2.77	2.79
35-35.9	3.47	2.94	....	2.80	2.83
36-36.9	3.52	2.97	....	2.83	2.87
37-37.9	3.56	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 1-26-59; East of California, January 3-10, 1957; Pennsylvania Grade 4-1-59.

§Union Oil Co. of California and General Petroleum Corp. posting 10c to 50c less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.25
Middle District	4.07
Southwest Pennsylvania	3.80
West Virginia	3.62
Buckeye Grade	3.47
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	11.50-12.00
★ Premium (99 octane)	14.25-14.75
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.75
Regular (92 octane)	11.00
Premium (98 octane)	12.25
California (rack) (Los Angeles):	
Regular (88 octane)	12.00-12.50
Premium (94 octane)	13.00-13.50
Premium (100 octane)	14.50-15.00
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.00-9.50
Diesel oil (58 d.i. and above)	8.75-9.25
Distillate No. 1	8.75-9.25
Distillate No. 2	8.00-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	8.25-8.375
Distillate No. 2	7.75-7.875
New York Harbor (barges):	
Kerosine 41-43	9.60
Distillate No. 2	9.10
Diesel fuel, 48-52 d.i.	9.40
Caribbean area (cargoes):	
Distillate No. 2	8.125

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$1.60-1.70
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-USNH, dirty (ATRS—32.5%)	$1.92
★ PG-France, dirty (USMC—70.5%)	3.22
★ PG-USNH, dirty (USMC—72.5%)	3.49

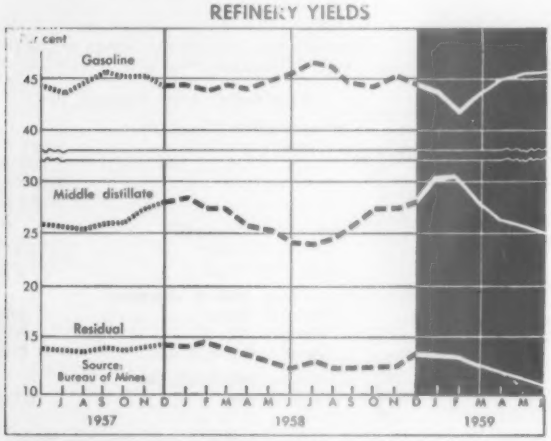
SELECTED MONTHLY DATA

SUPPLY AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

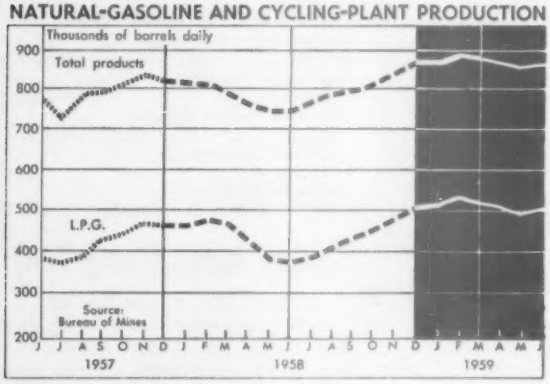
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
August 1959*	4,380	4,175	182,000
July 1959*	4,460	4,080	186,000
June 1959	4,517	4,153	196,078
Sept. 1958	4,104	3,978	175,337
August 1958	4,272	4,082	177,351
KEROSINE			
August 1959*	210	270	31,200
July 1959*	190	250	29,400
June 1959	154	244	27,364
Sept. 1958	202	285	31,259
August 1958	172	265	28,662
DISTILLATE			
August 1959*	1,120	1,800	161,600
July 1959*	1,100	1,720	139,800
June 1959	1,276	1,792	120,962
Sept. 1958	1,310	1,784	155,412
August 1958	1,109	1,706	139,862
RESIDUAL			
August 1959*	1,270	885	57,000
July 1959*	1,250	930	55,800
June 1959	1,431	915	55,479
Sept. 1958	1,348	973	67,670
August 1958	1,363	961	67,230

*Preliminary. †Thousands of barrels.

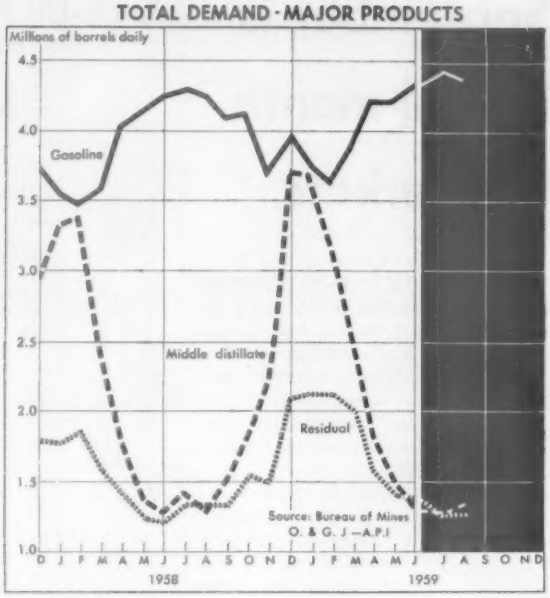
REFINERY YIELDS



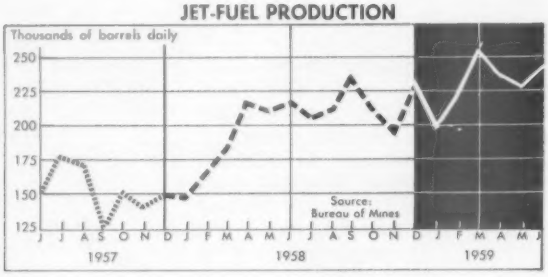
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



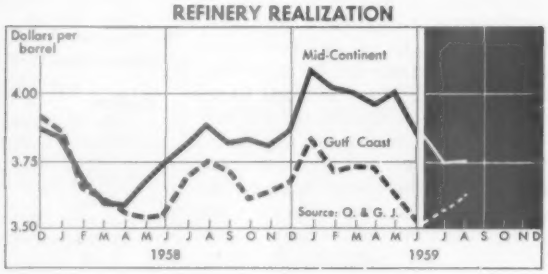
TOTAL DEMAND - MAJOR PRODUCTS



JET-FUEL PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	Aug.* 1959	July* 1959	June 1959	Aug. 1958
Mid-Continent	$3.76	$3.75	$3.83	$3.88
Gulf Coast	3.64	3.58	3.51	3.75

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

CLASSIFIED ADVERTISING

. . . your market place for the oil and gas industry

RATES:
UNDISPLAYED CLASSIFIED 20c a word one issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

DISPLAY CLASSIFIED
$10.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0257.

FOR SALE EQUIPMENT

1—750 HP B&W Marine Type Boiler H. F. Richardson, Box 888, Gladewater, Texas.

18" AND 20", good used pipe. Very attractive prices. Contact: The Tri-State Pipe Co., Bellaire, Ohio. Telephone OR 6-1452.

WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son. Pueblo, Colo.

TURBO EXHAUSTERS for sale—(1) Ingersoll-Rand Turbo Exhauster, 15,360 CFM @ 4.8 Psi. discharge pressure, driven by 454 HP. Moore Steam Turbine, 125 lbs. Steam 6,100 RPM with Ingersoll-Rand 2-Stage Barometeric Condenser. (1) Ingersoll-Rand Turbo Exhauster, 17,000 CFM @ 4.15 Psi. discharge pressure, driven by 678 HP. G.E. Steam Turbine, 125 lbs. Steam 4,600 RPM with Ingersoll-Rand 2-Stage Barometric Condenser. Excellent condition, attractively priced. Brill Equipment Co. 2401 Third Ave., New York 51, N. Y.

1—HERCULES FILTER Model 300, 50" diameter, Monel construction quick opening door, rotating cleaning mechanism. 4" inlet—4" outlet, three 4" drains connected to 8" drain header. Unitized on steel platform and complete with metering and centrifugal pumps, four electric motors and control panel. Filtering capacity 10,000 BWPD. New cost $27,000.00, never used. Additional description on request. Sell for 17,500.00—located near Grandfalls, Texas. Box L-470, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW LINE PIPE

11,000' 16" OD x .281 Wall 47.2#
6,600' 16" OD x .312 Wall 52.35#
4,600' 16" OD x .188 Wall 31.66#
10,900' 12¾" OD x .250 Wall 33.37#
50,000' 4½" OD x .188 Wall 8.64#

All Electricweld, Mill Tested, app. 40' DRL, Beveled. Priced attractively. Prompt shipment Detroit, Michigan, and Houston, Texas.

MID-STATES AND SUPPLY CO.
Tulsa, Oklahoma
P. O. Box 2534 Phone CHerry 2-9128

—CASING—

1950' of 5½" O.D.—17# J-55—61 jts. LT&C
7680' of 5½" O.D.—15.5# J-55—242 jts.
15,000' of 5½" O.D.—14# J-55—477 jts.

—SUCKER RODS—

4175' of ⅞" Rods—Bethlehem Type C-46 alloy—167 rods
300' of ⅞" Rods—National with Crall scrappers for 2½" tubing—12 Rods
2000' of ¾" Rods—Jones—2 with Crall scrapers for 2½" tubing—80 Rods

All equipment No. 1 grade, threads cleaned and doped. Located Joe Kelley Pipe Yard, Seminole, Oklahoma. Contact: Sterling Creel,

HOME STAKE PRODUCTION CO.
1808 Frank Lynn St.—Phone 2917
Seminole, Oklahoma

FOR SALE EQUIPMENT

FOR SALE—One 6" to 12" Used Pipe Cleaning and Priming Machine. Price, $1,000.00. Rogers & Wright Co., 710 Peoples Building, Charleston, West Va.

GAS METERS: Westcott Series A-75 Orifice Meters, 2,000 Lb., 100". Teflon Bearings and Mac Nick Clocks. All Types Foxboros. 250 Lb. 60-B Metric Positive Meters. George Milner. Box 124. Okmulgee, Okla.

FOR SALE—30,000 ft. New 4½" OD-15.5# PE Tubing. 150,000 ft. 10¾" OD-41.85# No. 1 Grade Used Line Pipe, PE or T&C. Lundquist Pipe & Supply Co. 325 Wright Bldg. Tulsa 3, Oklahoma. Phone LU 5-8850.

COMPLETE, SLIM-HOLE, portable, double-drum Franks drilling rig, with 5,500 ft. of 3½-in. drill pipe. Priced to sell. FOB; Sterling, Colorado. For details call: LA 2-3696 or write Box 325, Sterling, Colorado.

36" x 70' OVERALL LEBLOND COMBINATION OIL FIELD TURNING THREADING, BORING & TREPANNING LATHE (CAN BE USED AS A 25' CC LATHE).

Built 1941. Used in gov. arsenal only. Excel. condition. 16" hole in spindle, 36" chuck, 6" boring bar, 25' max. cap. Two carriages with tapers. 40-30-7½-5 HP motors. Replacement value $150,000. Terms. 90 day return guarantee.

Very reasonable with or without Boring Equipment.

EVEREADY SUPPLY CO
Phone Collect—
ED 4-9471 Bridgeport, Conn. Box 638

FOR SALE EQUIPMENT

1—U-15 Unit Rig Drawworks, with 3 Engine Unit Rig Compound with Pump Drive, Parkersburg 15" Dual Hydromatic Brake, Lebus grooved drum. Two Model LI-600 Cummins Engines. These engines have been converted to gas and have air starters. $8,000.00. Location: Kermit, Texas, phone JUniper 6-3491. Iverson Supply Company, Tulsa, Oklahoma.

—PIPE—

800,000 ft. 10¾" O.D. 35#
200,000 ft. 8⅝" O.D. 28½#
100,000 ft. 12¾" O.D. 40#
20,000 ft. 16" O.D. 42#.
all No. 1 grade, plain end cleaned.

INDIANA-OHIO PIPE CO.
P. O. Box 5412 Shepard Sta.
Phone C.L. 3-5527.
Columbus 3, Ohio.

FOR SALE ALL OR PART

1—set cresent steel 15½ bits 6 ft. long, 5" pins
1—set 12½ bits 6 ft. long
2—10" Wilson elevators
1—12½" Wilson elevator
1—14" Bailor
1—11" Bailor
1—16" Bailor
1—Unused 3KVA light plant
1—set unused Butler wire line clamps
1—4 Sheiv casing block with 6 ft. links
1—3A-6 newest type National drilling machine with C.C.S. reel and large Young drilling unit—perfect condition now running.

C. E. BEAL
202 Mid-Continent Bldg.,
Tulsa, Oklahoma. Phone GI-74750

LIQUIDATION

at ESSO REFINERY, Baltimore, Md.

- COMPLETE UNITS: FLUID COKER; CATALYTIC CRACKER; GIRBOTOL
- 20 Towers 2'6" to 16' dia. x 20' to 145', up to 300 psi.
- 50 Pressure Vessels from 12' x 50' to 3' x 7' up to 300 psi.
- 250 Heat Exchangers and Condensers 7,500 to 100 sq. ft.
- 20 Reboilers 2,700 to 450 sq. ft.
- 125 Hot Oil, Centrifugal and Steam Pumps.
- 3—500 HP RA5 Clark Gas Engine Compressors 17" x 14"
- 3—22,500 cfm I.R. Turbo Blower 29.65 psia. Motor or Turbine
- 7860 cfm CLARK Compressor 153 psia. 2000 HP Motor
- Reactor, Stripper & Scrubber 12'6" x 112' Stainless Internals
- 2—7000 BBL. Welded Storage Tanks ½" to ¼" Plate
- 1500 Controlling, Indicating, Transmitting Instruments

Hundreds of other items—send for complete catalog

HEAT & POWER CO., Inc.

Site Office—Boston & Haven Sts., P. O. Box 5203, Baltimore 24, Md., Dickens 2-0224
New York Office—60 East 42nd Street, New York 17, N.Y., MUrray Hill 7-5280
Tulsa Office—306 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890

SALES AGENTS FOR LIPSETT, INC.

FOR SALE EQUIPMENT

25,000 FT. 10¾" O.D. .307" wall, SRL, plain end, straight, extra good, used line pipe. Ready to re-lay as line pipe or would make excellent surfaces casing. Also, ideal for piling pipe. Many other sizes in stock. The Buckeye Supply Company, 18 Harrison Street, Zanesville, Ohio.

DRILLING TOOLS FOR RENT:

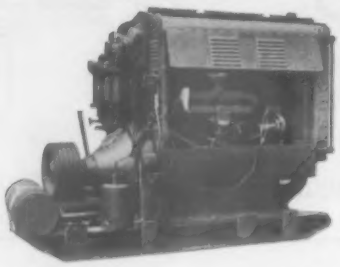
Drawworks, rotary tables, traveling blocks, swivel and hooks, kelly, mud pits, mud pumps, blowout preventor, mud mixing pumps, Drill Pipe and Drill Collars and other drilling equipment.

Drilling Equipment for Sale

Call: **CENTRAL TOOL & SUPPLY COMPANY**

MAin 4-6651, Liberal, Kansas
CEntral 2-6318, Oklahoma City

FOR SALE EQUIPMENT



NEW-SURPLUS BUDA POWER UNITS

121 H.P. Con Duty, 4 Cyl. Gas Engine w/Radiator, Clutch, 5 Sheave Pulley, Skid Mounted. Can be used w/L.P. or Natural Gas.

New condition $1,495.00 each

OLDFIELD EQUIPMENT CO.

430 W. Seymour Ave., Cincinnati 16, Ohio, VAlley 1-5582

1956 MAYHEW 2000 drilling rig, 58 foot mast on International 190 Tandem. Complete with doghouse and accessories. $25,000. P. O. Box 1049, Tulsa, Phone CHerry 2-6291.

3 COMPLETE UNIT rigs for sale. U-15 drawworks. 2 Rigs are powered by 3 NKU Waukesha engines. 1 rig powered by 2 LRO Waukesha engines. Drill pipe and collars optional. Rigs may be seen at Henson Drilling Company yard in Abilene, Texas. Complete inventory on request.

MODEL U-34 UNIT Drawworks, complete with 15" single Parkersburg Hydraulic Brake. Model WAK Waukesha Engine complete with ICK starting engine. 87' Lee C. Moore Cantilever type Mast complete with 4'x35½' substructure. Dave Morgan Oil Co., Box 820, Phone 295, Blackwell, Oklahoma.

FOR SALE—133' IDECO Full View Portable Mast, 9' Substructure. Wilson Giant single drum drawworks, complete with two engine compound, Oilwell 20½" rotary table with torque converter, 7½ x 16 Bethlehem G-300 Pump. Excellent condition guaranteed. Kirkpatrick Oil Co., 1300 N. Broadway, Oklahoma City, Phone CE 9-1416.

GAS COMPRESSOR—Used (Gardner Denver) 6½" x 12", Single stage. Powered by Waukesha 6NKRBU engine. Three years old. Recent complete overhaul. New crank shaft. Reply to P. O. Box 1066, Corsicana, Texas, Attn: Bryan Jordan, Jr., Phone TRemont 4-8221.

7500' BREWSTER, powered Waukesha N.K.Us. just completed 7570' test. Oilwell 7 x 14 pump; Parkersburg heavy duty 122' derrick; 8x14 steel tool house; shale shaker; mud mixer, completely equipped. G & W Oil Company, 'phone 2672, or P.O. Box 36, Duck Hill, Mississippi.

PIPE LINE PUMP—Waukesha 6-MZAU power unit on Worthington Rotary Pump 4-GR. Skid mounted. Excellent condition. $1,500.00. Bellaire Pipe & Supply Co. 8020 Lyons, Orchard 4-2763, Houston 29, Texas.

BLACK'S OF SCOTLAND—makers of Tents and Sleeping Bags and suppliers of a complete range of rugged Field Equipment serve the leading Oil & Exploration Companies in development projects all over the world. Write for full list. Black's, Greenock, Scotland.

CUT EXPLORATION COST!

For Sale, Original Seismic Records in Oklahoma, Kansas, Texas, Colorado, Nebraska, North Dakota and Montana. These records are offered for a small fraction of their initial cost. For detail shot point maps, write:

BOX L-487,

THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

IMMEDIATE DELIVERY

Pipe: 40,000 ft. 2⅜" 9% nickel P-105 Tested 9500#—95 cents per foot; 10,300 ft. 4½" Grade E 1660# X-Hole Reed Shrink Grip drill pipe, Tuboscope No. 2N3—$1.75 per foot.

1—Truck mounted hydrostatic Pipe Testing Machine with all fittings—$1.250.00.

Buy—Sell—Trade used pumping units.

Pumping Units Co. of Texas
134 Nellie Esperson Bldg.
Phone CA 7-0295,
Houston 2, Texas

LIQUIDATION

OF AMOCO REFINERY, DESTREHAN, LA.

- 19,000 BBL. CAT CRACKER (1953)
- 2,000 BBL. ALKYLATION (1953)
- 5—B&W BOILERS, 70,000 #/hr. 500 PSI. (1952)
- 50—80,000 & 55,000 BBL. TANKS
- 90—TOWERS & VESSELS, 2' to 12' dia. and 30' to 110' high
- 80—HEAT EXCHANGERS, 78 to 6,100 sq. ft.
- 3,170 CFM I-R 2-STAGE COMPRESSOR. Type HHE-2. 125 PSI. 600 HP Syn. Motor
- 5—FURNACES 1,300 to 2,200 sq. ft. Heating Surface
- 150 CENTRIFUGAL, HOT OIL and STEAM PUMPS
- 2—CARRIER CENTRIFUGAL COMPRESSORS, 38,300 CFM and 9,370 CFM with 3,370 HP and 2,310 HP TURBINES
- 500 INSTRUMENTS; RECORDING, CONTROLLING, ETC.
- 2—AMCO CAN SEALERS, 1 qt. and 5 qt.

PIPE in Carload or Truckload Lots from 1" to 16".
TANK PLATE in Carload or Truckload Lots ¼" to ¾".

DESCRIPTIVE BOOKLET WITH FULL SPECIFICATIONS AVAILABLE
WRITE • WIRE • PHONE TODAY

BRILL EQUIPMENT COMPANY
ESTABLISHED 1926
2401 THIRD AVE., N. Y. 51, N. Y. — CYPRESS 2-5703
4101 SAN JACINTO, HOUSTON, TEXAS — JACKSON 6-1351

Liquidation Site Office—Destrehan, La.—Telephone Norco 6571

USED PIPELINE PUMPS & MOTORS

2—Byron Jackson 15 HHH vertical pumps, 350 gpm, 3340' head, 3550 rpm, 20 stage
3—300 HP motors for above, 1 Westinghouse CS vertical, 2 Louis Allis EX vertical, all 3 phase, 2300 volt, explosionproof
2—Ingersoll-Rand 2½ RT8 horizontal pumps, 233 gpm, 2350' head, 3575 rpm, 8 stage
2—200 HP motors for above, 1 Westinghouse CS, 1 General Electric KF, both 3 phase 2300 volt, explosionproof with starters
3—Ingersoll - Rand 2AGT horizontal pumps, 233 gpm, 915' head, 3565 rpm, 2 stage
1—100 HP motor for above, GE KF, 3 phase 2300 volt, explosionproof with starter

Above equipment is in good condition, and may be seen in operation on our McPherson to Council Bluffs products pipeline until replacement with larger equipment during the first part of October. For further information, phone, wire, or write to:

Mr. M. C. Hagar, Purchasing Agent.
National Cooperative Refinery Assn.
Box 770, McPherson, Kansas

FOR SALE EQUIPMENT

Another Large Auction

W. F. DOWNS WELL SERVICE

MAGNOLIA, ARKANSAS

WELL SERVICING EQUIPMENT, TRUCKS, TRAILERS, OILFIELD AND SERVICE TOOLS AND EQUIPMENT, PIPE, CASING, TUBING, PUMPS AND OTHER EQUIPMENT

Wednesday, Sept. 30, 1959
10:00 A.M. (CST)

Registration Starting at 9
Inspection Beginning Sept. 23

Mr. W. F. Downs is getting out of the well servicing business and has commissioned Wayne Cook Associates, Inc. to sell all of his equipment and tools at public auction piecemeal to the highest bidders. This is fine equipment ready to be put to work.

EACH AND EVERY ITEM MUST AND WILL BE SOLD WITHOUT MINIMUM OR RESERVATION

The sale will include such items as:

WELL SERVICE EQUIPMENT incl. Wilson Giant Drawworks; EMSCO D-175 Mud Pump, Hillman Kelly Tubing Tongs, Wilson Mogul Torcair "42" Drawworks, Wilson 7¼ x 12 Mud Pump, BJ Hyd. Tubing Tongs, Substructures, RS Cardwell Drilling Unit with 87 ft. Wilson mast, 7¼x10 G-D Pump, 2 Moore 87 ft. derricks and 2 Beard derricks and many other such items.

TRUCKS AND TRAILERS incl. 1953 Dodge 500 V8 with fishtail bed, 5th wheel, 34 Tulsa; 1954 Int. R210 Tandem with oilfield bed, RTB, 2 Tulsa winches; 1952 Int. K190 with OF bed, RTB, Tulsa winch; 1953 Dodge 2½ Ton with OF Bed, RTB, Tulsa winch; 1956 GMC 370 V8 Tandem with 5th wheel; 1957 Dodge Pickup; 1957 Dodge V8 700 with fishtail bed, 5th wheel, Tulsa winch and others.
ALSO—Hobbs 30 ft. tandem and single axle floats, other single axle floats, tandem and single axle pole trailers, water tank trailer and much truck equipment such as tires, wheels etc.

IHC TD 14 with 12 ft. Blade, Tulsa Winch, Gin Poles.

MANY TOOLS AND MUCH EQUIPMENT FOR OILWELL SERVICE incl. Flanges, Kelleys, Crown Blocks, Traveling Blocks, Sleeves, Hoses, Mud Tanks, Tool Houses, Ramps, Lines, Cutters, Elevators, Bales, Kelley Bushings, Chicksan Joints and many, many such items too numerous to list.

PIPE, CASING AND TUBING incl. 12,000 ft. of 6 in. OD 20# N-80 casing, 14,700 ft. of 2½ in. EUE Tubing, 13,100 ft. of ⅞ in. and ¾ in. sucker rods, and many more as well as racks, etc.

TOOLS, FUEL TANKS, COMPRESSORS, LIGHT PLANTS, PUMPS and thousands of other items far too numerous to mention here.

FOR DETAILED BROCHURE, contact:

Wayne Cook Associates, Inc.

"The Nation's Leading Auctioneers"
192 Meadows Building, Dallas 6, Texas
EMerson 3-3388

WANT TO SELL?

Learn why auction is your best way and we can do the best job. Call today collect. No obligation, of course.

FOR SALE EQUIPMENT

1 BUCYRUS—ERIE 36L Spudder, late model. Rig complete with tools and equipment. Cassel Drilling Co. Inc., Dumas, Texas. Phone WE 5-5019 or WE 5-4369.

4000' 6⅝ Drill Pipe w/tool joints, good condition.—W. D. Kelley Drilling Co., 409 Combs-Worley Bldg., Pampa, Texas.

4000 FOOT trailer mounted double drum rotary drilling rig complete ready to work. Desco, Inc. Oklahoma City OR 7-4949.

FOR SALE U-15 Rig, call Central Tool & Supply Company Main 4-6651, Liberal, Kansas; Central 2-6318, Oklahoma City.

FOURTEEN USED OIL iron tanks. Capacity of each tank is 35,000 barrels. Weight of each tank is about 70 tons. These tanks are in excellent condition and can be used again for oil. For further information contact: West Ohio Pipe Company, P. O. Box 193, Lima, Ohio. Phone CA 6-0821.

WORK OVER RIG Bucyrus Erie 36-L. Diesel Engine, 86' Telescoping mast, Rotary take off with friction clutch. Tandem wheels, 4' Substructure. James Drilling Co. Tulsa, TE 6-4795.

EQUIPMENT WANTED

WANT 15,000' 2⅞" Drill Pipe. Call CE 2-6318 Oklahoma City, MAin 4-6651, Liberal, Kansas.

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED!

Three POWER SQUARING SHEARS—10' or 12' x ¼", ⅜" and ½" capacity. Furnish full details, including make, model and serial number.

VALLEY STEEL PRODUCTS CO.
Frank Corgiat, PRospect 3-3020
St. Louis 4, Missouri

WANTED AT ONCE!

6⅝" OD x .250/.280" wall Steel Pipe, sub-std. or prime.
Will buy outright or will trade you our New ½", ¾", 2", 2½", 3", 4", 5½", 8⅝", 10¾", 12¾", 16", 20", 22", 24", 26" or 30" Steel Pipe.

WHAT HAVE YOU?

Joe Conway
VALLEY STEEL PRODUCTS CO.
Phone: PRospect 3-3020
124 Sidney St., St. Louis, Mo.

HELP WANTED

DESIGN ENGINEERS

Oil & Gas Production Equipment: Midwest manufacturers of Oil & Gas Processing Equipment requires engineers with design experience. Mail resume including references and salary requirements. Our Employes know of this advertisement.

Box L-492,
The Oil and Gas Journal,
Tulsa, Oklahoma

HELP WANTED

PETROLEUM ENGINEER WANTED
5 years or more actual waterflooding and production experience in supervisory capacity. Salary range $800.00 up according to ability. Box L-493, The Oil and Gas Journal, Tulsa, Oklahoma.

TRANSLATORS, Proven ability to translate technical material into fluent English essential. Attractive full time or free-lance arrangement. All languages of interest, particularly Russian. Send resume to: A•T•S, Inc., Drawer 271, East Orange, N.J.

ASPHALT PLANT superintendent or engineer with experience and good references for new plant in desirable Caribbean area. Box L-469, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs, 500 selected producing, refining, butane and pipeline companies. Nationwide. $7.50 cash. OIML Co., Box 2803, Tulsa, Okla.

FOREMAN TO take charge of Hydrocarbon Treating, Water Treating and HF Alkylation Unit. Prefer man with Science degree. Location Southwest. Box L-482, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN, experienced: To handle land work for petroleum subsidiary of major mining concern. Base location, Denver, Colorado. Business administration and/or legal education desirable. Age 25-35. Resume of experience and qualifications requested. Box L-481, The Oil and Gas Journal, Tulsa, Oklahoma.

AGGRESSIVE independent wire-line service company needs experienced salesman—Oklahoma City and surrounding area. Salary commensurate with experience and ability to produce. Box L-489, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER with at least five years refinery experience acquainted with Crude, Catalytic-Cracking, Catalytic Reforming and Alkylation Units. 20,000 Bbl. Plant located in Southwest. Box L-490, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Refinery Process Engineer with three to five years experience in general refinery operations. Our plant is being expanded, and additional personnel are necessary. Furnish references, complete details of education and experience. Also, plant employment record and salary received. All replies considered confidential. Reply to Box No. L-477, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION ENGINEERS
CONTINENTAL OIL COMPANY

We have openings in district offices of our domestic producing operations. Minimum of three years production experience plus BS degree required. Experience in reservoir engineering, waterflooding, down-hole corrosion, gas operations, or general field operations is acceptable. Response should include salary expected and complete resume of education and experience. Reply to Chief Engineer, Production Department.

Continental Oil Company,
P. O. Box 2197, Houston, Texas.

SITUATION WANTED

SENIOR GEOLOGIST—Seismologist, Major, Independent, Consultant, Foreign and Gulf Coast experience, particularly South Texas. Resume on request. Box L-483, The Oil and Gas Journal, Tulsa, Okla.

SAFETY ENGINEER—Age 32—8 years experience, 3 years in Production & Refinery. 5 years in Drilling Operations in Oklahoma, Kansas, Texas, Louisiana, Offshore and Rocky Mountain Area. B.S.—Industrial Education. Box L-486, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

GEOLOGIST—32, nine years sub-surface, stratigraphic, geophysical experience Texas-Louisiana Gulf Coast. Prefer Gulf Coast or foreign connection. Box L-478, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

LEASE AND DRILLING BLOCKS

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

KENTUCKY OIL BOOM

Prompt details to any company, individual or group financially able to drill and wholly own 600' oil well on choice of 40 separate oil and gas leases ranging from 25 to 500 acres out of 6,000 contiguous acres containing 16 shut-in shallower gas wells in Metcalfe County, Kentucky. Phone EXpress 3367 or write Omar Cheer, 301 Civic Center Building, New Orleans 12, Louisiana.

Drilling and Production Deals Wanted

Interested in acquiring complete or partial interest in drilling, producing, or farmout properties. Canada included particularly Saskatchewan.

SYNDICATE OIL CORPORATION
409 Beacon Building
Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

I WILL DRILL your shallow prospect or buy your producing interest. U. S. Andersen, 8350 Santa Monica Blvd., Los Angeles 46, Calif.

WANT TO DRILL the N½ of the NW¼ of Sec. 16 T.13N R.12E Okmulgee, County, Okla. containing 80 Acres, Virgin Bartlesville Sand 1410 ft. Need a partner to help with the drilling and completing. Write Oil & Gas Journal P. O. Box L-460, Tulsa, Okla.

FOR SALE OR LEASE—Approximately 6 acres with 40' x 60' warehouse and radio tower 1½ miles Northeast Pratt, Kansas on railroad. Call or write Graham-Michaelis Drilling Company, Wichita, Kansas.

FOURTEEN DIFFERENT leases: Containing approximately 3500 acres: Located in Baca, Bent, Kiowa, Prowers and Lincoln counties, Colorado. Almost entire area leased for oil and gas to major companies. Prefer sell all in one package: But will divide, or sell undivided interest or interests. Write for particulars to: W. J. Clay, 2005 W. T. Waggoner Building, Fort Worth, Texas.

HAVE UNDER lease in Cumberland County Kentucky, over 2,000 acres. Close to production and is in area where some of the biggest oil wells were found. Also have over 2,000 acres in Pickett County, Tenn. This has all been geology tested and found good. Contact Ditch & Hanna Company, 132 So. Grant Street, Phone Howard (HO) 20826, Wooster, Ohio.

MAP RACKS

COMPLETE LINE OF MAP RACKS

for oil companies, geologists, engineers for compact storage of maps, prints, charts and drawings. All steel welded construction, ball bearing casters, baked on black enamel. Hold from 30 to 100 map tubes. Write today for description and low prices.

Frontier Manufacturing Company
P. O. Box 13266, Dallas 20, Texas

LEASE AND DRILLING BLOCKS

LEASING 450 ACRES of oil lands in Trinidad British West Indies—For information write to Albert Edwards, 9647 Wentworth Ave., Chicago 28, Illinois.

WATER FLOOD Franklin County, Kansas. 640 acres, good engineering and best equipment, modern in every respect. Wonderful potential, good reason for selling. No brokers. Unless you are financially responsible do not reply. Box L-326, The Oil and Gas Journal, Tulsa, Oklahoma.

REAL ESTATE

MERCANTILE DALLAS BUILDING

14th Floor—Approx. 3800 Sq. Ft.
Desirable Sub-Lease—Attractive Rate

H. E. Canada
1404 Mercantile Dallas Bldg.
RIverside 7-7011 Dallas

CONDENSATE WANTED

GASOLINE CONDENSATE WANTED

Desire to begin purchasing all or part of 45,000 barrels per month 400 to 650 degree end point condensate delivered to barge on the Mississippi watershed. Will consider small volume producers as well as large. All replies will be held confidential. Please respond with all available analytical, quantity, and location data to:

Box L-491,
The Oil and Gas Journal
Tulsa, Oklahoma.

NEW JOURNAL MANUALS

You will want one or more of these recently released technical manuals for your working library.

1. CATALYTIC REFORMING . . .
where we are and where we are going with this important refining process.

2. ON THE JOB . . . IN THE PLANTS
The Journal's popular series in manual form.

3. PIPELINE HYDRAULICS
for the crude-oil and products pipeline engineer.

4. FLUID FLOW FORMULAS . . .
for the gas pipeline engineer.

5. JOB IMPROVEMENT FOR THE PROCESS FOREMAN
from The Foreman's Page . . . devoted to the training of operators and first-line foremen in oil-processing plants.

6. OPERATING AND MAINTAINING THE CAT CRACKER
designed to give you a better understanding of Cat Cracking functions.

7. GOING PLACES?
The Journal's self-improvement series for men on the way up.

8. DEPRECIATION . . .
What it is . . . How it's computed . . . Why it's important . . .

EACH $1

Clip the coupon and send it with your payment.

Please send me manuals nos. .....
To:
Name .....
Address .....
City & State .....
I am enclosing $ .....

Reader Service Department
THE OIL AND GAS JOURNAL
P. O. Box 1260 Tulsa, Okla.

PRODUCTION WANTED

WANTED: 250,000 barrels and up, or equivalent gas, fair price, cash, with or without development drilling and /or drilling deals. Box L-441, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

DRILL STEM Testing Tool available on a Franchise—Royalty Basis. Write: Box L-483, The Oil & Gas Journal, Tulsa. Giving experience, qualifications, and financial reference. Replies held confidential.

FINANCIAL CONTACTS, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant, 817, 81st Street, Brooklyn, N. Y.

FOR RENT

FOR RENT
PACKAGED GAS COMPRESSORS

Immediate shipment on three "like-new" skid-mounted units. 170 hp, 110 hp, and 55 hp sizes. Available for short or long-term leasing.

Write or call:
KNIGHT MFG. & SUPPLY CO.,
Box 5426, Tulsa, Okla.
TEmple 8-3304

LEGAL

DEPARTMENT OF THE Interior, Bureau of Indian Affairs, Jicarilla Indian Agency, Dulce, New Mexico. Sealed bids will be received until 3:00 P.M., Mountain Standard Time, September 30, 1959, and then opened at that time in the Office of the Jicarilla Indian Agency, Dulce, New Mexico, for the leasing of 46,531 acres of Tribal Indian land located in Rio Arriba County, New Mexico, within the Jicarilla Indian Reservation, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Superintendent of the Jicarilla Indian Agency, Dulce, New Mexico.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that 160.30 acres of land in the Barksdale Air Force Base, Bossier Parish, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.D.T., October 14, 1959 when bids will be opened. Additional information concerning this lease offering, how and where to submit bids, copies of the lease agreement and bid forms may be obtained from the Geological Survey's Branch of Oil and Gas Leasing, General Services Administration Building, Washington 25, D. C., and from the Minerals Staff Office, or the Eastern States Office of the Bureau of Land Management, Interior Building, Washington 25, D. C., Edward Woozley, Director.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Salt Lake City, Utah. Notice is hereby given that approximately 240 acres of land in two parcels within the known geologic structure of the Bar-X Field, Utah, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M. M.S.T., October 15, 1959, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Land Office, 312 Federal Building, Salt Lake City, Utah.

ADVERTISERS
. . . in this issue

ACF Industries, Incorporated, W-K-M Division 6
Ajax Iron Works 15
Allis-Chalmers 121, 123
American Air Filter Co., Inc. 126, 127
American Cyanamid Company, Refinery Chemicals Department 40
American Iron & Machine Works Co. 14
American Machine & Foundry Company, The J. B. Beaird Company, Inc. subsidiary 33
American Meter Company 24
Anderson Company, The V. D. 107
Atlas Pipe Inc. 71
Axelson Manufacturing Company, A Division of U. S. Industries, Inc. 142, 143

Baash-Ross Division of Joy Manufacturing Company 36
Baker Oil Tools, Inc. 54
Baroid Division, National Lead Co. 50
Beaird Company, Inc., The J. B., a subsidiary of American Machine & Foundry Company 33
Bendix Aviation Corporation 30
Black, Sivalls & Bryson, Inc. 138, 139
Bonney Forge & Tool Works 129
Bovaird Supply Co., The 1

CB/Southern Inc. 38, 39
Cabot Shops, Inc. ..... Inside Back Cover
Canadian Pacific Airlines 172
Cardwell Mfg. Co., Inc. 37
Central Scientific Co. 173
Chiksan Company 44
Classified Advertising 195, 196, 197, 198
Colorado Fuel and Iron Corp. 12
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 19
Continental Equipment Co. 172
Cooper, Inc., Fred E. 146, 147
Coppus Engineering Corporation 9
Crane Co. 69
Crose Manufacturing Co., Inc., M. J. .. 109

Dallas Mfg. Company 128
Darling Valve and Mfg. Co. 45
Denison Engineering Division, American Brake Shoe Co. 184
Dowell 52, 53
Drilling Equipment Manufacturing Co. 152
Duff-Norton Company 47

Electric Controller & Mfg. Company, The 48
Electro-Motive Division, General Motors 178, 179
Emsco Screen Pipe Company 181

Fairbanks, Morse & Co. 42
Farris Engineering Corp. 145
Fischer & Porter Company 56
Fisher Governor Company 172

Garrett Oil Tools Division of U. S. Industries, Inc. 177
Goodrich Chemical Company, B. F. (GEON) 5
Great Lakes Carbon Corporation, Mining & Mineral Products Division ... 132
Gulf Oil Corporation 21

Halliburton Oil Well Cementing Co. Inside Front Cover 7, 75, 161
Hamer Valves, Inc. 125
Homco 35
Huey & Co., S. E. 107
Hughes Tool Co. ..... Back Cover
Hycalog, Inc. 144

Jensen Bros. Mfg. Co., Inc. 149
Johnston Testers, Inc. 18
Jones Company, The S. M. 11
Joy Manufacturing Company 22

Kelley Company, Ben F. 182
Keystone Development Corporation .. 107
KLM Royal Dutch Airlines 151

Larkin Packer Company, Inc. 153
Layne & Bowler, Inc. 13
Liberty Manufacturing Company of Texas 20
Love Box Company 128
Lufkin Foundry & Machine Co. 8
Lunkenheimer Co., The 31

Macco Oil Tool Co. 129
Markal Company 180
Marsh Instrument Co. 150
Martin, Manufacturer, John N. 83
Mayo Hotel, The 152
Mercantile National Bank 173
Mid-Continent Supply Company 26, 135
Mission Mfg. Company 46

Nalco Chemical Company 16, 17
National Tank Company 200
Nelson Electric Mfg. Co. 148

Oil States Rubber Company 154
Oil Well Supply Division 4
Otis Engineering Corporation 43

Pacific Pumps, Inc., a division of Dresser Industries, Inc. 49
Pan Geo Atlas Corp. 156
Parkersburg Rig & Reel Co. 2
Peerless Pump Division of Food Machinery & Chemical Corporation .. 133
Penn Controls, Inc. 137
Perforating Guns Atlas Corporation ... 156
Petroleum Distributing Company 154
Petroleum Electric Power Assn. 10
Phoenix-Rheinrohr AG 155
Porter Company, Inc., H. K. Thermoid Division 144
Reda Pump Company 181
Reed Roller Bit Company 100, 101
Refinery Supply Co., The 173
Republic National Bank of Dallas 168
Rockford Clutch Division of Borg-Warner Company 174
Rockwood Sprinkler Company 99
Roebling's Sons Company, John A. ... 102
Rust-Oleum Corporation 23

Schlumberger Well Surveying Corp. ... 183
Scott-Rice Company 172
Square D Company 48
Stauffer Chemical Company 25
Stewart & Stevenson Services, Inc. ... 140
Sumitomo Metals Industries, Ltd. 109

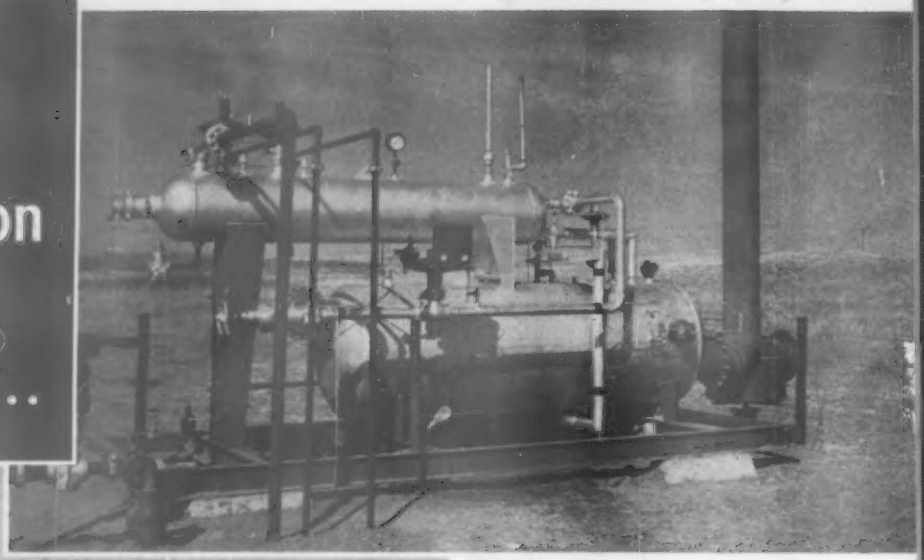
Taylor Instrument Companies 130, 131
Texsteam Corporation 176
Thermoid Division, H. K. Porter Company, Inc. 144
Thompson Pump Company 173
Thompson Tool Co. 175
Thornhill-Craver Co. 27
Timken Roller Bearing Company Steel and Tube Division 165
Twin Disc Clutch Company 34

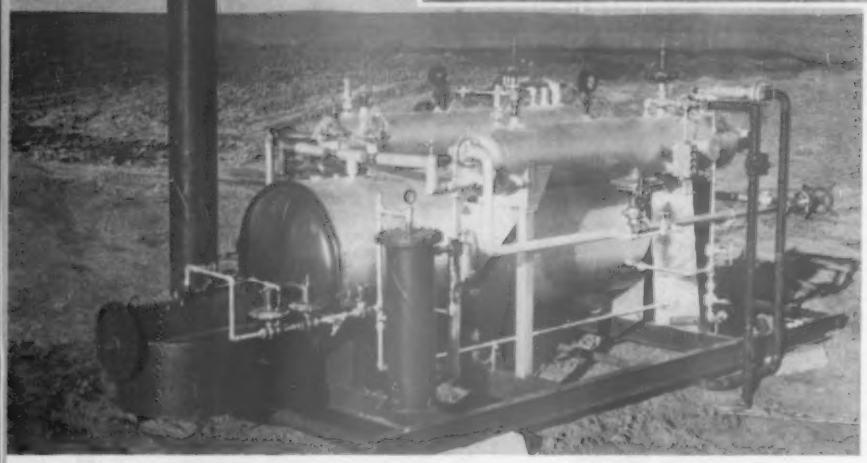
United States Rubber Company 3
United States Steel Corporation—Oil Well Supply Division 4

Washington Iron Works, Inc. 148
Welex, Inc. 169
Well Equipment Mfg. Corp. 32
Well Reconnaissance, Inc. 172
Wheland Company, The 136
Wiedeke Company, The Gustav 108
W-K-M Division of ACF Industries Incorporated 6
Wyandotte Chemicals Corporation 134

Youngstown Sheet and Tube Company 28, 29

Another all new "Production Pak" by National®...





▲ Compact design and construction with built-in safety features assure the producer trouble-free operation.

◀ Dual producing "Production Pak" with one steam generator, two three-phase separators, flame arrestor and safety fuel gas scrubber.

Patented and Patents Pending

National Steam Generating Production Unit Model "WOG"

The National Steam Generating "Production Pak" is a pre-piped, skid-mounted, three-phase separation system with a steam generator. This production unit is specially designed to produce wells that require pre-heat before choking down to separator pressures.

Automatic controls and valves maintain absolute control over water bath temperatures and sales gas leaving separator.

Use of a steam generator to heat the separator base and well stream in place of the conventional water bath heater method permits a higher MTD and less area requirement plus a convenient and dependable means of moving heat to the base of the separator.

Separator and generator are code stamped, and the unit is equipped with National's Flame Arrestor to prevent back flash.

These units have been proven in service in Oklahoma, Kansas and the Texas Panhandle.

National's Steam Generating Production Units are available in sizes from 2.5 MM cf/d to handle single, dual and triple completed wells.

It's a National®

NATIONAL TANK COMPANY

DRAWER 1710

TULSA, OKLAHOMA

CHECK YOUR PUMPING COSTS!

....With Cabot's Rugged Dependability and 24 Hour Field Service!

The simplicity and ruggedness of Cabot's Pumping Units built from years of field engineering experience and modern manufacturing methods assures long life with low operating costs. Field service and parts, when required, are available on a 24 hour basis from all Cabot-Franks Service Depots.

Dependability and low cost operating life make Cabot Pumping Units your best long term pumping investment. *See your J & L salesman or Cabot representative today.* When you buy, BUY CABOT.

OIL FIELD PUMPING EQUIPMENT
CABOT
PAMPA, TEXAS
FRANKS
DIVISION OF CABOT

Hughes ENGINEERED BIT PROGRAMS are cutting hole time... lowering bit costs

Many operators are already familiar with and are benefiting from this special service – the *Hughes Engineered Bit Program.*

Where Hughes bit programs are being followed, some spectacular results are being achieved.

In developing a Hughes program for a given well or wells, our representative works with the operator in determining the types of bits to be used – from top to bottom, drilling weights for each bit, rotary speeds and hydraulics. These recommendations are based on the most complete performance data available... and on the industry's most extensive rock bit experience.

Of special importance to each operator is the fact that the Hughes bit programs take into consideration the operator's equipment and how to get the most out of it... at the lowest cost.

If you are not now taking advantage of this Hughes service, we suggest that you give our representative an opportunity to work with you in developing a *Hughes Engineered Bit Program* for your next well.

*"Hydraulics for Jet Bits" and "Hydraulics in Rotary Drilling" are copyrighted by Hughes Tool Company.

HUGHES TOOL COMPANY

50TH ANNIVERSARY YEAR 1909 – 1959